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[OFFICIAL NOTICE.]

Fifth Meeting, American Gas Institute.

HEADQUARTERS, AMERICAN GAS INSTITUTE,
OFFICE OF SECRETARY,
29 West 39th St., New York City, October 26th, 1910.

The fifth annual meeting of the American Gas Institute will be held in the Auditorium of the United Engineering Societies Building, 29 West 39th street, New York city, commencing Wednesday, October 19, 1910.

On Wednesday and Thursday there will be two business sessions each day. Between the sessions a luncheon will be served in the rooms above the Auditorium.

Wednesday evening, at 8 P.M., the members and ladies will be the guests of the New York Edison Company, at the Electrical Show, Madison Square Garden. Mr. J. W. Lieb, Jr., will deliver an address. The special exhibit of the New York Edison Company will be reserved for the exclusive use of the party, until 10 P.M.

Thursday evening there will be a banquet for members at the Hotel Astor, and a theater party for the ladies.

The Committee on Arrangements has completed its plans for the Steamboat Excursion, on Friday, October 21st. After a trip around the Island of Manhattan, a landing will be made at the United States Navy Yard, in Brooklyn, and luncheon will be served there.

The Committee on Arrangements estimates that a member's ticket for the banquet, and other features, including the entertainment of one lady of the member's immediate family, will cost not to exceed $10. Members attending without ladies may obtain tickets at a less cost.

The following papers have been prepared for this meeting:

"The Lighting and Ventilation of Gas Appliance Display Rooms," by Thomas Scofield.

"Manufacture of Balloon Gas in Water Gas Apparatus," by Geo. H. Waring.

"Pneumatic Calking with Lead Wool of 30-inch, 36-inch and 48-inch Mains," by C. C. Simpson, Jr.

"Cultivation of Friendly Relations Between the Public and the Lighting Company," by W. J. Clark.

"Construction of a Reinforced Concrete Tank for a Gasholder," by V. L. Elbert.

"Brick, Concrete and Steel Holder Tanks," by H. W. Aldrich.

"The Laying of One 48-inch and Two 36 inch Gas Mains under the Harlem River," by C. C. Simpson.

"The Laying of a Pair of 30-inch Cast Iron Mains under the Passaic River," by A. H. Strecker.

"Apparatus Designed for Remote Control of District Pressure," by J. S. Kennedy.

"Pumps for Gas Work Purposes," by H. L. Underhill.

"Removal of Organic Sulphur from Gas," by H. M. Papst.

"The Extraction of Cyanogen from Coal Gas at the Astoria Works," by M. E. Mueller.

"Determination of Calorific Value and of Operating Conditions from Analysis of Industrial Cases," by J. M. Morehead.

"A Review of Recent Decisions of the Public Service Commissions which Affect Gas Companies," by A. E. Forstall.

"The Public Deceived by Faulty Data and Misleading Analysis of Data," by Dr. A. C. Humphreys.

Two other papers have been promised, and there will be several reports from special committees.

Most of these papers will be ready, in advance form, in about a week. Members particularly interested in certain papers can have copies forwarded by notifying the Secretary.

The Passenger Associations will allow members special convention rates on the usual certificate plan, at 1½ the regular fare, with the exception of the following Passenger Associations: New England, Southeastern (covering States south of the Virginias, and the Ohio river, east of the Mississippi river), and the Western (covering territory west of Chicago, Peoria and St. Louis to, and including, Denver and Cheyenne). The Transcontinental Passenger Association will not allow convention rates, but calls attention to its special tourists' excursion rates, good for 9 months. Members in territory covered by the Westen Passenger Association can purchase regular tickets to Chicago or St. Louis, and get convention rates from such points.

Please note the following points about getting certificates. Tickets for the regular, full one-way, first class fare, for the going journey, must be secured within 3 days (exclusive of Sunday), prior to and during the first day of the meeting (October 19th). When purchasing ticket, be sure to ask for a *certificate*. Certificates may not be kept at some of the smaller stations. In such cases, the agent can inform you as to the nearest point where they are kept, and a local ticket can be purchased to that point.

Upon your arrival at the meeting, present your certificates for endorsement. A special agent of the Associations will attend the meeting on October 20th, and validate the certificate for the return trip, charging a fee of 25 cents for each certificate. No refund of fare will be made on account of failure to have certificate validated.

Important.—Your particular attention is directed to the absolute necessity of furnishing information on the return postal card, sent you by same mail, as to whether you will attend the steamboat excursion on Friday; as to whether you will have a member of your immediate family with you, and as to whether you will have any

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additional guests. The arrangements for the Friday excursion are such that, once made, the Committee would be very much embarrassed to provide for unexpected guests.

Please be particular to reply, as heretofore requested, to every question on the postal card, and return the postal card at once.

A. B. BEADLE, Secretary.

[OFFICIAL NOTICE.]

Fourth Annual Meeting, Illuminating Engineering Society.

THE ILLUMINATING ENGINEERING SOCIETY,
OFFICE OF THE SECRETARY,
29 W. 39TH STREET, N. Y. CITY, Sept. 29, 1910.

From the present indications, the next annual convention of the Illuminating Engineering Society, to be held in Baltimore, October 24th and 25th, just preceding the course of lectures on illuminating subjects, to be given at Johns Hopkins University, will have the largest attendance of any convention held since the organization of the Society. A great deal of interest has been directed toward the course of illuminating engineering, since its announcement several months ago. Many men associated with the illuminating industry will be among those present at this meeting of the Society and at the formal opening of the Illuminating Engineering Course at the University. This convention and the Course in Illuminating Engineering, held under the joint auspices of the University and the Society, will undoubtedly mark an epoch in the advancement of the work on the betterment of illumination. Detailed arrangements are not sufficiently complete, at present, for announcement.

The 36 lectures which compose the Illuminating Engineering Course will be delivered by the men most prominent in the line of work upon which they will lecture. The complete course of lectures will be given between the dates of October 26th and November 8th.

Officers of the Society desire that this Course in Illuminating Engineering be brought before the attention of those directly connected with, or interested in the lighting industry. The large increase in the Society membership, and the great amount of interest in illuminating engineering which has been generally shown, indicate that much success will reward the endeavors of those who have arranged for the lecture course at the University.

Sufficient facilities have been provided for complete demonstrations at the lectures; apparatus for experimental work, under the supervision of the experts of the University and the Society, will allow for practical and personal demonstrations and understanding of the details which are to be covered by the lectures. The laboratory instruction is intended to be of utmost importance in conjunction with the lectures. A fee of $25 will be charged for admission to the course of lectures and the laboratory instruction.

Although no solicitation has been made, either on the part of the University or the Society, more than 80 applications have been received from the men directly interested in this endeavor to found an engineering course for this branch of work, which has been of a more or less indefinite quantity. In order to prepare for sufficient accommodations it is advisable that those expecting to attend the university course should make application at once. Cards of admission or further information relative to the course may be obtained from the Registrar of Johns Hopkins University, Baltimore, or from Mr. Preston S. Millar, Secretary of the Illuminating Engineering Society, 29 West 39th street, New York city.

BRIEFLY TOLD.

OUTDOOR LIGHTING IN ENGLAND.—We print to-day the second of a series of articles, prepared expressly for the JOURNAL, by our English correspondent, Mr. Norton H. Humphrys, of Salisbury (whose "Special English Correspondence" has been enjoyed by our readers for many years) under the title of "Outdoor Lighting" in London. The author, besides his monthly letter, which so graphically and interestingly tells of the condition of gas affairs in England, has also prepared for us many special articles on matters pertaining to the industry, every one of which had the merit of originality and the finish which goes with an intimate knowledge of the subject treated; but, interesting and valuable as these have been, and even yet are, we are certain that no mistake is made when we assert that this present series will exceed in interest and value any other matter that is traceable to his well-stored mind and his pleasing pen. For over two-score years Mr. Humphrys has had practically to do with all phases of gas manufacture and distribution, and one result of his carefulness is a thorough comity and faith between the Directors of the Company that supplies the world-famous center of Salisbury with the light of the present. Of a surety, our readers can trust to the full that everything Mr. Humphrys writes in this (or any other, for that matter) connection is accurate and reliable.

ILLUMINATING ENGINEERING.—Announcement has been made of the course in illuminating engineering, to be given at the Johns Hopkins University, Baltimore, Md., beginning the 26th inst. and terminating the 8th prox. This magnificent course (for such in reality it will prove) is to be given under the direct and joint auspices of the University and of the Illuminating Engineering Society, and if current indications are the true pointers to ultimate results, this course will mark a new era in the development of the lighting industry. Within a remarkably short period the "engineering of illumination," if we may understandingly so write, has acquired prominence in the rank and scope of engineering circles, and this joint course will properly serve as the formal announcement and pronouncement that "It has come of age." The lecturers have been invited by the University, upon and through the counsel of the Society, and their names will be at once recognized as leaders in their divisions, both at home and abroad. At no other time, or since the advent of the Society, has there been an opportunity for those busily engaged in the manufacturing and selling of various lighting mediums and accessories to obtain a thoroughly practical insight into the subject, and many in the profession, whose reputations are as great as those of the lecturers, will be found amongst the student body. The higher officials of gas companies, from President down or up to Manager, will be well repaid should they enroll, and if the demands upon their time are such as to preclude this, at least one representative of every fair-sized plant should be in attendance. Full information regarding the course may be obtained from Mr. Preston S. Millar, Secretary of the Society (29 West 39th street, New York), or from the Registrar of the University. It is presumed, as it certainly is to be expected, that those who propose to attend have formally notified Mr. H. K. Dodson (Chairman Committee of Arrangements) of their intention. His address is: Mr. H. K. Dodson, 100 West Lexington street, Baltimore, Md.

CURRENT MENTION—

WE are indebted to the courtesy of Mr. Sidney Mason, President of the Welsbach Company, for a copy of an excellent photographic reproduction of its magnificent plant at Gloucester City, N. J. In describing this picture it is noted that, in extent of buildings and ground, that plant covers 20½ acres, and comprises 93 buildings, with a total floor area of 361,000 square feet. It has an annual capacity of 60,000,000 lamps and mantles. All of which goes to show that the Company progresses with the growth of the industry, which industry it has done much fine work to uphold.

MR. ALEXANDER WYNESS, JR., for the past year Assistant to Manager West, of the Houghton County (Mich.) Gas and Coke Company, has been appointed Manager of the Calumet (Mich.) Gas and Coke Company. The appointee is a son of Mr. Alexander Wyness, the ever-watchful Superintendent of the gas division of the business of the Spartanburg (S. C.) Railway, Gas and Electric Company. In connection with the latter we may note that the gas section thereof is growing rapidly, in fact, so great has been the advance that the Company is contemplating the erection of additional apparatus, to include generators and a new holder.

Correspondence.

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

The American Gas Construction Company and the Gas Supply of Ames, Ia.

AMERICAN GAS CONSTRUCTION CO.,
NEWTON, IA., October 10, 1910.

To the Editors AMERICAN GAS LIGHT JOURNAL: The writer * * * is certainly pleased with the optimistic view which you take of the future for the gas business in Ames. Ames at the present time has a population of about 4,000 people, and during the College year (9 months out of '12) there are about 1,800 to 2,000 students. We have personally known the city for the last 20 years, and our father, Mr. C. W. Tenney, who was engineer for the State of Iowa about 40 years ago, laid out the College grounds and campus, so that our family are quite conversant with its past growth and its probable future developments. The Tenney installation for Ames was sold under a guarantee to produce 6,000 cubic feet of gas per hour, and the plant shows a capacity for 9,000, and is only limited to this amount by the size of the compressor. There has been provision made for the installation of duplicate apparatus throughout, inclusive of storage tanks, so that, with a comparatively small outlay, this plant would have an hourly capacity of at least 16,000 cubic feet of gas; and we do "honestly" believe that there is no other standard gas works on the market that will deliver a given quality of gas to the consumer, in communities such as Ames, at a cost so small as is being done by the "Tenney Process." Our gas works have been tested by some of the most competent and leading gas engineers in this country, men who are employed by the United Gas Improvement Company. We have their recommendations for our settings and process in preference to the Standard Lowe machine to be operated in smaller cities.

As a matter of news, you will probably be glad to know that we have just closed a contract for the building of one of our complete plants for the Decorah Gas Company, at Decorah, Ia. This Company was organized largely by people living at Vinton, Ia., where one of our plants has been in operation the past 2 years. We have also recently made a contract with Mr. G. C. Gochnauer, of Harrisburg, Pa., for the building of several of our plants in the State of Pennsylvania. Yours truly, AMERICAN CONSTRUCTION COMPANY,
By C. I. TENNEY, President.

Outdoor Lighting in England.

[By Mr. Norton H. Humphrys.]

No. II.—Retrospective.

Under the old-fashioned regime, it rarely happened that sufficient interest was taken in the matter of public lighting, to insure lanterns, burners, etc., being maintained in smart and efficient condition. Frequently the apparatus was not only very indifferent as regards design, but suffered from neglect in the matter of repair. A 5 cubic feet per hour flat flame, on a burner clean and free from dirt or corrosion, a windproof lantern with sufficient but not excessive air supply, and a properly regulated pressure of gas, insuring a steady flame and absence of smoke, is a very effective light, and if arranged with skill and judgment, evenly and not too thinly dispersed, a very respectable showing can be made. But as much cannot be said if the burner is in bad condition, the gas supply excessive, the glass dirty, and an opening left in the bottom of the lantern for convenience in lighting, which produces (except in phenomenally calm weather) a flickering, unsteady, smoky flame and speedily clouds the upper part of the lantern with soot. Yet the second picture would be a more correct presentment of the condition of affairs in the average provincial town than the first. It was nobody's business or interest to keep up an efficient light. The main thing was to drive the tightest possible bargain, in respect to supply of gas and cut down all incidental expenses such as repair and renewal. If the lanterns, etc., stood badly in need of overhauling, it was cheaper to rail at the gas company for supplying bad gas than to find the necessary expenditure. Gas companies had not appreciated the advantages of a well lighted district as a means of advertisement, or for that matter did not seek anything in the way of advertisement, seeing that the natural growth of their business was quite as much as they cared to keep pace with. If they did, it was quite possible that they had no control in the matter, seeing that the majority of the local authorities at that time preferred to keep the whole of the detail arrangements such as lighting, cleaning, extinguishing or repairing, entirely under their own control. They provided the apparatus, and the inferior quality of the same was accentuated by the insufficient quantity, the posts, from considerations of economy, being spaced 80, 100, or even a greater number of yards apart. There was no idea of getting the full value or duty from the quantity of gas used, though every care was taken to see that the full quantity of gas contracted for was consumed, which is rather a different thing. This may be the reason why, for more than 50 years, the improvements effected in the design of appliances for street lighting were confined to automatic or self-acting pressure regulators for maintaining an even pressure and preventing excessive consumption of gas.

The introduction of the electric arc and the incandescent gas light constituted important epochs in the history of our subject, and one sometimes hears a remark to the effect that, previously to the invention of these appliances, gas was represented exclusively by the 5-cubic foot flat flame burner. But the attempt to provide a light center of over 20-candle power may be dated some time further back, to the time of the bringing out of cheap petroleum and the cheap petroleum lamp. It must be remembered that the usual prices for gas were 50 to 100 per cent. more than they are at present, and under these conditions the application of petroleum, both for public or private lighting, offered such economies that it appealed strongly to the poorer classes of the communities. The central draught, hanging lamp, giving a steady, brilliant light of 50 to 80 candle power, compared favorably in point of efficiency with the average gas burner, and in some districts the competition was keenly felt. Messrs. W. Sugg & Co. and Messrs. George Bray & Co., who at that time were the leading makers of flat flame burners, and indeed had nearly reached the limits of refinement in respect to these appliances, brought out the combinations of burners known as high power flat flames, giving an effective duty up to 500-candle power in one lantern. These were very successful, the diffusive power being great on account of the large area of the light source, and this was also valuable in the matter of avoiding sharp shadows, which are very objectionable under any circumstances. The high power lamps met with great approval and were largely adopted for special purposes, such as important centers or crossings or high-class thoroughfares, but were considered too costly for general use. Later there were several varieties of the regenerator type of lamp, of which the Siemens and the Wenham are perhaps the best known types. They served a useful purpose in their time, but do not call for more than a passing notice, because they have been entirely displaced by the Welsbach light.

But there is nothing that can compare with the incandescent burner as regards a broad and far reaching effect upon outdoor light. While the light developing properties of flat flame and regenerator burners appear to have reached a practical limit of 3 and 6 candles per cubic foot of gas consumed respectively, there are no signs of any corresponding practical limit with regard to the incandescent burner. Starting with a duty of about 15 candles per cubic foot, it has gradually crept up to double that quantity at ordinary pressures, and to 60 candles or more with intensified pressures. Concurrently with this remarkable development of efficiency there has been a fall of 30 per cent. or more in the selling price of gas. Local authorities have slowly but surely realized two points. The first is that they buy light, not gas, and that the question to be considered is not how much gas is being used, but how much light is supplied. And the record is that local authorities have plenty to see after, without dabbling in the employment of lamplighters or the repair of lanterns, and that the better plan is to invite a fixed inclusive price for certain stated candle powers to comprise all expenses for material and labor. If the contractors are also asked to incur a considerable initial outlay, as may be the case in new districts, or where the existing columns, lanterns, etc., are unsuitable or worn out, they must be protected by a term of contract sufficiently long to allow recoupment of the outlay. Of course, it would be unreasonable to expect them to provide special plant for a twelvemonth or 2 years' contract, at the end of which time the appliances may be thrown on their hands, because a large consignment of second-hand columns or lanterns will realize a very low price.

The incandescent burner did not receive an over-flattering reception either from gas engineers or the public engineers and surveyors. There was a general impression, that until the mantle could be made tougher and stronger, its use would be very limited. This has proved to be quite incorrect, because little if any improvement has been made in the direction of strengthening the mantle, and yet the incandescent burner has entirely displaced the other forms of burners for outside lighting and to a large extent for inside light. It cannot be denied that the fragile nature ef the mantle is not without advantages. If it had been of a more robust, rough-and-ready nature, it would have received the same careless, negligent usage that has been such a marked feature with the flat flame burner. We have noticed that the flat flame was frequently to be seen under unfavorable condition as to pressure supply and protection from draught, and that the obvious defects were not ascribed to the real cause, but to the quality of the gas. And as a result many people supposed that flicker and smoke, to a greater or less extent, must be accepted as unavoidable. But if the incandescent burner is to give satisfactory results it must receive a fair amount of competent attention, and this continual inspection of the burner has not been without a useful influence as regards improvement. An appliance that is continually in evidence receives more attention, thought and care than one that is left alone from one year's end to the other, and to get an article under constant review is to start it half way on the road to improvement. The incandescent burner *must* be carefully protected from draught and have a sufficient gas supply pressure. It offers the advantage that there is not a substantial loss of value, but an improved effect, by excessive pressure of gas supply. Not only the burner itself but the lantern and the whole of the appliances have received an amount of revision that, if directed to the flat flame, would secure for it a much better character than it at present possesses, thanks largely to its many friends.

The introduction of the incandescent light was greatly handicapped by the high prices not only of mantles but of all necessary appliances, and by an impression that it meant an entire fit out for the top of each column—new lantern, burner, pressure regulator and anti-vibrating device. Obviously the initial outlay is a difficult matter. The gas company does not look favorably upon it, and local authorities, as a rule, have nothing to spare for initial outlays of any kind. They are up to their ears in debt as it is. So long as an outlay of 40s. or more per lamp was considered to be necessary the thing hung fire. But it soon became apparent that old-fashioned lanterns, if worth it, could be easily and cheaply converted. One of the first experiments made by the writer was to obtain a dozen of the existing pattern. Both sets were fitted with the same pattern and size of incandescent burners, and the results showed that one was as good as the other, and that any lantern that was not absolutely worn out could be fitted with the incandescent burner at a cost of a few shillings. The usual plan followed is to look over the stock of lanterns and to reject those that are worn out or so near to their end that outlay for repair is not

warranted. They are replaced by a similar number of the specially made lanterns, which are fixed in the most prominent positions in the principal streets, the old lanterns being used in the back streets and odd corners. The usual experience is that the change from flat flame to incandescent gives such satisfaction that several additional lamps are ordered. In any case, the question of the utilization of existing lanterns now presents no difficulty. Several reliable firms will undertake the conversion or supply of the necessary fixtures at a very low price.

Another hindrance was the idea that to make a success of the street lighting an anti-vibration device must be used. The earlier installations included some fearful and wonderful combination of weights, springs, flexible tube connections, or helical tube, that was supposed to weaken the effect of vibration and prolong the life of the mantle The device at the best was no ornament, and frequently inclined to the reverse, and it had a bad effect in advertising the fragility of the mantle. People formed the very natural conclusion that an appliance requiring so much bolstering and propping up was not likely to be a success in a private house. Further experience showed that if the use of an anti-vibrator was desirable when mantles cost 1s. 3d. each, it is not required except in special circumstances, now that the cost of the mantle is 3d. or 4s. The saving is not worth the initial outlay.

The flat flame burner could be rigged up anyhow and anywhere, but more care must be taken in regard to the fit up if the incandescent burner is to be a success. In any case the lantern ought to be so far windproof that the flame is steady and does not waver, but with the incandescent it must conform to these conditions. The lamp column must be perfectly plumb, firm and rigid, and columns of light design, particularly those of steel tube, are not to be recommended, as if at all liable to vibration, trouble will result. Steel tube columns should in any case have a cast iron foot or base extending above ground line. If new columns are ordered specially for incandescent lights, a little extra expenditure in the weight is a wise investment, and this especially applies to the pediment and footplate. Some designs are so defective in this respect, and give such a narrow base for support, that the column settles in one direction or another out of the perpendicular. With the flat flame the only objection to this is the bad appearance, but with the incandescent anything that interferes with the exact upright set of the mantle and burner is a serious objection. If the subsoil is at all weak or uncertain a large stone or cement slab may be laid for the base plate to rest on. The same precaution, followed up with regard to the upright supply pipe, will save continual trouble in future. With the flat flame the bend at the bottom was fixed loosely and the upright screwed into it, leaving the whole free to vibrate in sympathy with heavy traffic or other disturbing cause. But for incandescent burners the bend and base of the pipe should be packed solidly, and the pipe may also be held firmly in position by a collar at the top of the column. In cold or variable climates it is a good plan to fill up the column round the service pipe with any suitable non-conducting material, so as to protect it from variation of temperature. In this case care should be taken that the collar or cap at the top is watertight and that moisture cannot rise by capilliary attraction from the base. Because a non-conducting composition must always be *dry*. If water can get in, it is worse than useless. Ten or 12 feet of upright ¾-inch pipe carried loosely in a column having an interior spacing 3 inches or so in diameter will be liable to vibration from the slightest cause. The lanterns should be solidly secured to the top of the column by screws and nuts, not carried in a loose frame or cradle, and so placed as not to touch or bear upon the service pipe at the point where it rises through the bottom. These points may appear trivial, but I have known much annoyance and unnecessary consumption of mantles to be caused by negligence in respect to them.

[Continued from page 682.]

Liability of Gas Companies for Injuries Resulting from Escape of Gas.

[Prepared for the JOURNAL, by MR. JOHN EDSON BRADY, Attorney-at-Law.]

GAS COMPANIES NOT LIABLE AS INSURERS FOR ACCIDENTS CAUSED BY ESCAPE OF GAS.

Res Ipsa Loquitur.—As a general rule negligence is not presumed. There are cases, however, where the maxim, *res ipsa loquitur*, meaning "the thing speaks for itself," applies, and from the thing done, or omitted to be done, negligence is presumed. Thus, negligence may be inferred from the fact of the explosion of a steam boiler on a vessel. The fact that a wall of a cistern fell by its own weigh raises a presumption of negligence. And the falling of a brick from a bridge has been held to warrant a presumption of negligence on the owner of the bridge.

A gas company was sued by a woman who was injured by an explosion of gas in the cellar of the house in which she lived, claiming that the explosion was caused by the negligence of an employee of the company. Schaum *v.* Equitable Gas Light Company; 15 N. Y. App. Div., 74. The evidence showed that the employee came to the house for some purpose connected with the gas pipes, asked for a pair of pliers and a candle, went into the cellar and commenced hammering. Shortly afterward there was a smell of gas, which was escaping in large quantity. By some means it was discovered that the workman was unconscious in the cellar. Two or three men went down for the purpose of rescuing him, heard him moaning, but were unable to see him, and so went to the front of the cellar, and were about to pick him up, when, as someone testified, "A big flash of fire came around us and scattered us all over the floor." There was no evidence to show that that the workman had lighted the candle, and no evidence as to what had caused the explosion.

It was held that it was not a case for the application of the doctrine of *res ipsa loquitur*, which, as has been said, is a general way of saying that the circumstances attendant upon an accident are of themselves of such a character as to justify a jury in inferring negligence as the cause of that accident. Gas companies are not insurers against all accidents, but are simply bound to that degree of care which the nature of the article they deal in, and the consequences to be apprehended from an accident, reasonably call for. The law does not exact an unreasonable amount of care from anyone. In the opinion it was said: "There is no evidence in the case at bar of any negligence on the part of the defendant which was the proximate cause of the explosion. It was not sufficient for the plaintiff to show that an explosion happened where the business of the defendant was lawful and useful; but she was bound to show that the explosion resulted from the negligence of the defendant or its servants, and this she failed to show at the trial." It was not sufficient to surmise that the workman lighted the candle or that he caused the explosion in some other manner. The plaintiff could not recover because she failed affirmatively to establish negligence.

The doctrine of *res ipsa loquitur* was held in Peoples Gas Light and Coke Company *v.* Porter; 102 Ills. App., 461 (1902), not to apply to a cracked or broken pipe, through which gas escaped and injured the sleeping occupant of a room by asphyxiation. The injured person, it appeared, kept a drug store, in the rear of which he had his sleeping room. After retiring on the night of the accident, he remembered nothing until he awoke in the hospital. Someone in the neighborhood had noticed the odor of the escaping gas, had traced it to the drug store and then had the druggist taken out of the gas filled sleeping apartment. The Company was held not to be liable, for, said the court: "The defendant is not liable as an insurer; its duty was to furnish reasonably good and sufficient material suitable for the purpose for which it was intended and used, and to put the material in place in a good and workmanlike manner. If it fulfilled this duty it was not guilty of negligence."

Company Held Liable Regardless of Negligence.—Under a statute in force in Ohio a natural gas company was held responsible for an explosion, regardless of whether or not it had been guilty of negligence. The record disclosed that the defendant was a corporation engaged in distributing natural gas in the city of Youngstown, O., for fuel purposes. The plaintiff was the owner of property which was substantially destroyed by an explosion of gas in a street adjacent to his property. The statute referred to, which is section 3651 (a) of the Revised Statutes, and which made the act governing gas, electric and water companies applicable to natural gas companies, read as follows: "But said company shall be liable for any damages that may result from the transportation of the same." The company contended that the statute should be construed to impose liability only in case of negligent transportation of gas. The court said: "Upon principles of universal application the company would be held liable for any damages that might result from its negligence in transporting natural gas through the streets of a city; therefore, to construe the statute as the defendant contends, would deny it any operation or effect whatever. We think that, when the subtle and dangerous properties of this fluid are considered, together with the long existing, and perhaps still unsettled, controversy, that has claimed the attention of courts and text writers, both in England and in this country, respecting the extent of the liability of those who

deal in dangerous substances, for damages caused by them, the absence of the word "negligent," in the act declaring the liability of the defendant, has great significance, and can only be reconciled with a legislative purpose to impose upon the company the duty of absolutely controlling this substance whenever it should introduce it into places where, if it escaped control, it would menace the lives and property of others who had no control over it, and who were without fault themselves contributing to injury." Gas Fuel Company *v.* Andrews, 50 Ohio St., 695; 35 N. E. Rep., 1059.

Injuries Caused by Inhalation.

A large percentage of the actions for damages brought against gas companies spring from the inhalation of gas that escapes from a company's pipes. It has been observed, in an earlier chapter of this series, that the mere fact that gas which escapes from the pipes of a gas company and is taken into the lungs of some unsuspecting person, does not render the company liable for the ensuing damage. That is, the company is not liable as an insurer. Unless negligence on the part of the company can be shown, the company cannot be held in damages.

With respect to this class of cases, there are certain duties or obligations which the law imposes upon gas companies, and to be found lax in the performance of one of these obligations may, in general, be said to amount to negligence. For instance, a company is bound to see that its mains are placed at a proper depth, to the end that the danger of their becoming cracked by frost may be as far as possible eliminated. They must be laid with a view to avoid their becoming broken by a settling of the earth which supports them. And it rests upon the company to see to it that the pipes are of a material sufficiently strong and durable to meet the conditions under which they are to be used.

Necessity of Showing Negligence on Part of Company.—It appeared, from evidence in the case of Carmody *v.* Boston Gas Light Company, 162 Mass. 539 (1835), that the injuries complained of were caused by an escape of gas into the plaintiffs' apartments from the defendant's pipes in the street, the plaintiff inhaling the gas while asleep. The defective condition of the pipe, according to the plaintiff's evidence, was that the pipe was rotten. A large hole appeared in the pipe on the morning after the accident, which the witnesses testified was a foot long and 2 or 3 inches wide, on the upper roll of the pipe. It further appeared that there was no perceptible smell of gas in their rooms when the plaintiffs retired at about 9 o'clock P.M. Evidence was introduced by the defendant tending to prove that the pipe was properly laid, that it was suitable for the purposes for which it was intended, and that, after it had been laid, a drain had been dug from the house occupied by the plaintiffs to the sewer in the middle of the street, without notice to the defendant company; that the ground had settled under the gas pipe where the drain was dug, and that the gas pipe had been broken by the settlement of the ground under it. The portion of pipe which was broken was introduced as evidence and showed only a small crack running round it. There was no hole on the top of the pipe as described by the plaintiffs' witnesses. The Judge charged the jury as follows: "The mere fact that a pipe broke and the gas escaped is not of itself sufficient to establish the liability of the company. It is evidence for you to consider upon the question of neglect, but there is other evidence bearing upon this question of neglect, and so it becomes a matter for you to determine, in view of all the evidence bearing upon the question, the burden being upon the plaintiffs to satisfy you, as a result of all the evidence, that there was in fact a neglect by the defendant, through which, and by means of which, this gas escaped."

The jury decided in favor of the defendant company, and this was affirmed upon an appeal taken by the plaintiffs. The company was not shown to have been guilty of negligence and could not, therefore, be held liable for damages.

Proximate Cause.—Although a gas company may have been negligent in the performance of some duty owed to a person injured, no liability attaches to the company unless the negligent act was the *proximate cause* of the injury. In order to establish a proximate cause it is necessary that there should be a casual connection between the negligent act and the injury; the act must have been such that without it the injury would not have happened. To illustrate, in an action brought to recover damages for the destruction of flowers in a greenhouse, caused by gas escaping from negligently constructed gas mains, the complaint set forth that the flowers not destroyed by the gas were rendered worthless, because they could not be marketed in a small quantity, the only demand being for the complete line, as existing before any of the stock was destroyed. It was held that the escaping gas was the proximate cause of the loss resulting from the failure to sell that part of the stock which the gas did not destroy.

The question of proximate cause came up in the case of Richmond *v.* Gay, 103 Va., 320; 49 S. E. Rep., 482. The action was brought against the city of Richmond, Va., to recover damages for the death of a Mrs. Gay by asphyxiation, claimed to have resulted from the negligence of the city in permitting illuminating gas, which it manufactured and furnished to its residents for profit, to escape from its mains into the room in a hotel in which Mrs. Gay was sleeping. The evidence showed that gas had been escaping from time to time into the printing office on the ground floor of the hotel, and also into some of the other rooms of the hotel for some weeks prior to the death of Mrs. Gay, that the city had been notified, and that some efforts had been made, though not very promptly or energetically, to remedy the trouble, but that the efforts had not met with success. There was evidence tending to show that no gas had escaped into the room occupied by Mrs. Gay and that, on the night she was asphyxiated, her daughter had visited her room after midnight, and that no gas was escaping at that time. The gas had escaped from the main into a sewer, and from it, through a private connecting pipe, into the hotel. It was held that the fact that the gas reached Mrs. Gay's chamber in this manner, instead of directly from the gas mains, did not render the city's negligence any the less the proximate cause of her death, "Unless there was some cause intervening between the defendant's negligence and her death. And in order to excuse the defendant's negligence, this intervening cause must be either a superseding or responsible cause. To be a superseding cause, whether intelligent or not, it must so entirely supersede the operation of the defendant's negligence, that it alone, without the defendant's contributing negligence thereto in the slightest degree, produces the injury. To be a responsible cause, it must be the culpuble act of a human being who is legally responsible for his act." It was held that there was no such intervening cause in this case and that the company was liable.

Duty of Company where it has Received Notice that there is a Leak in its Pipes.—When a gas company is notified that gas is escaping from one of its mains the company is under an obligation to stop the leak with all reasonable dispatch. Sipple *v.* Gas Light Company, 125 Mo. App., 81, 102; S. W. Rep., 608 (1907). In that case the company was notified, at about noon on Saturday, that gas was leaking at a certain point. About 3 o'clock in the afternoon the company notified one of its inspectors, having charge of the district, of this and other reported leaks. The inspector proceeded to look after the various leaks, and, in the regular course, came to the scene of the leak in question, at about 7 in the evening. Finding himself unable to locate the leak, he notified the proper officer, who in turn, dispatched the "trouble wagon" and men to find the leak and make the necessary repairs. These men arrived about 10 o'clock, commenced excavating and continued until about 2 o'clock of the next morning, when they suspended operations until 7. In the meantime, a person sleeping in a house in the locality affected by the escaping gas, met death by asphyxiation.

In finding the defendant company guilty of negligence, the court said: "It is well settled that when the gas company has received actual notice of a leak in its mains, great diligence is required in locating the cause and applying a remedy. Of course, this must follow in consequence of the highly dangerous character of the commodity, and unless it is a case of great calamity or emergency, such as an earthquake, explosions, the conflagration of a portion of a city, or something tending to produce many leaks at the same time, it is said that there should always be men in readiness for such purpose, and action looking to repairs should be had with promptness. The facts gleaned from the record before us and above set out certainly did not show that degree of diligence required by the law in the escape of gas after actual notice of the leak. The law requires promptness and dispatch to fill the measure of ordinary diligence in such cases, and there was certainly no such diligence shown by the proof."

(To be Continued.)

Chemical Control of Oil Gas Manufacture.

[Paper prepared by Mr. E. L. Hall, Portland, Ore., for the 18th Meeting, Pacific Coast Gas Association.]

By chemical control is meant the technical supervision over the process of manufacture necessary for maintaining or improving the quality of the product, while at the same time endeavoring to reduce the cost per unit. Chemical control will be treated of in this paper from the standpoint of conditions on the Pacific Slope, where the bulk of illuminating gas is made from crude oil alone.

The problems confronting the oil gas chemist are mainly the same as those encountered in water gas or coal gas. They are, however, if anything, simpler, due to the elimination of coal as a manufactur-

ing material and of coke and tar as by-products; but there are some problems peculiar to oil gas. The routine duties of the oil gas chemist may be divided under the following heads:

1. Control for illumination and calorific values.
2. Control for purification.
3. Control for naphthaline troubles.
4. Miscellaneous control.
5. Control of operating conditions, and technical report.
6. Valuation of raw materials.
7. Experimental work.
8. Appliance work and illuminating photometry.
9. Control for illuminating and calorific values.

A sufficiency of tests should be made to enable the foreman or head gas maker to keep the product uniform. The larger the holder capacity the easier it will be to maintain a uniform standard. All tests for record should be made at the outlet of the main storage holder. I strongly deprecate the practice of estimating the quality of the product by test at the inlet of the storage holder for the following reasons: The proper place for the final valuation of the quality is, as near as possible, to the actual consumer; that is to say, the outlet of the storage holder. At this point the loss in candle power becomes more gradual, for it is not generally recognized that there is quite an appreciable drop in quality while the gas travels from inlet to outlet of the holder. The effect of the consumer's service is well represented by the small laboratory service.

The control of the actual operation of the generators can still be carried out by means of the test line at the inlet of the holder with the difference now that the tests are no longer for record. By this means of control, the candle power of the gas in the street mains should be kept within a daily maximum variation of 1 candle, and within a monthly average maximum and average minimum difference of ½-candle power.

A thorough knowledge of the working of the generator, and the result to the candle power in the holder from any particular variation from the routine and the ability to offset this by some other change, are the true secrets of quality control; which is, of course, rendered much easier when a number of sets are operating together. It is greatly desirable that the night foreman or engineer be able to continue this system of control.

In making tests for illuminating power, on the bar photometer, it is very seldom that enough attention is given to selection of the proper tip to develop to the full the candle power inherent to the gas under test. In this connection it may be of interest to show the accompanying diagram worked out for oil gas, illustrating the wide variations of candle power with tips of different sizes. In this experiment, full time was given at each test for the gases of different quality to purge out the photometer meter and connections. Two things are apparent from the diagram:

1. The tip orifice should be smaller with an appreciation in the quality of the gas, and *vice versa*. This will result in a change of the issuing velocity of the gas, drawing in more primary air into the flame, thus burning in the inner cone a greater amount of the carbon of decomposition. In finding the proper tip, one merely determines what part of the carbon in the gas it is necessary to burn in the inner cone to raise the remainder to the highest degree of luminosity. This happens generally when the flame is just on the point of smoking.

2. That where there is any considerable change in the quality of the gas to be tested it is imperative to find the proper tip for the test by a preliminary trial, and this is the more important as the quality diminishes.

It becomes natural to wonder where the consumer "gets off at" in this case. The answer is that, having determined the most satisfactory candle power to carry, and having educated the consumer up to the proper tip for this candle power, the quality of the gas made should not vary enough to render a change of tip necessary. Happily, moreover, the illuminating standard is gradually yielding to the calorific standard, which is really of more concern to the consumer. The practice of estimating illuminating values with the open tip is shown to be open to considerable error, and even the proper open tip for the quality under consideration does not develop the full value of the flame.

The use of Argand burners, and especially of the No. 2 Metropolitan (or Carpenter) burner thus becomes imperative. The latter, as shown by the diagram, will develop from 2 to 3 more candle power than the most suitable tip and is adjustable for the variation in quality. The

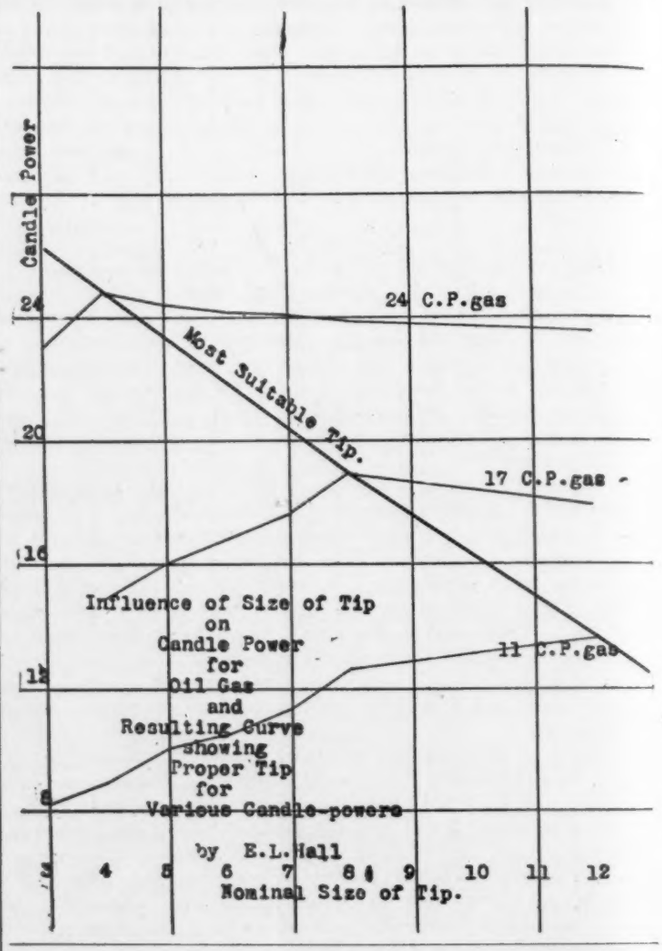

Fig 1.

relative effectiveness of this burner diminishes with the higher illuminating values, when tests are made at 5 cubic feet per hour, and with the same length of chimney. I will not go more fully into bar photometer work except for the following hints:

There is no excuse at present for making bar photometer tests with any other than the pentane standard.

The light on the bar photometer should burn continuously. It is better that the gas for testing should not pass through a service meter.

If the gas shows a tendency to deposit light oils in the test meter, the latter should be frequently drained out and refilled. The service and photometer connections should be well graded towards drips, which should be regularly drained.

In connection with the illuminating value of oil gas, it must be borne in mind that high value by no means signifies good service to the consumer. It has been my experience that anything above 19 or 20-candle power is going to give a great deal of dissatisfaction, mainly by reason of imperfect combustion and because of the larger size of the flame, which causes increased breakage in globes, chimneys and shades.

While the time has not yet arrived when we can altogether abandon the illuminating standard of quality, yet the calorific requirements can now be claimed as of the first importance. It is doubtless true that, with most manufactured illuminating gases, high calorific value follows from high illuminating value. The relation between illuminating and calorific values seems to be fairly constant for oil gas where the manufacture is not complicated by the utilization of lampblack as a generator fuel. The accompanying diagram will serve to represent the relation between the two. It cannot be said definitely that the same is unvariable, or that the curve should be a straight line. The diagram has been plotted from the averages of many simultaneous illuminating and calorific tests.

Calorific tests should invariably be made as close as possible after the illuminating test, and preferably upon the same stored sample, which can also be used for the gas analysis. In this way we are enabled to obtain definite relations between the three tests, and we have, in addition, checks upon the daily valuation of the product. A point

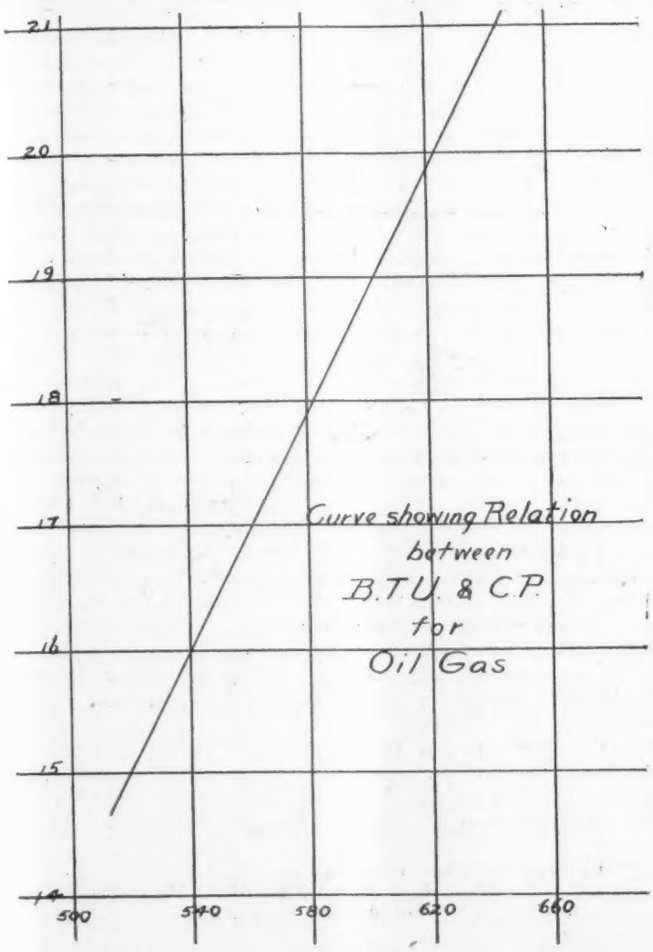

Fig. 2.

often overlooked in calorimetry is the maintaining of the water supply, room temperature and the waste gases from the instrument, at as near the same temperature as possible. For this purpose a water tank holding sufficient supply for 24 hours is very advisable.

In making the calorimeter tests the water heated by the gas under test should be weighed, not measured. The very sensitive thermometers used in making the observations of temperature should by all means have been compared and found in agreement with a calibrated thermometer.

It is well for the gas chemist to avail himself of the splendid service afforded by the Bureau of Standards, at Washington, D. C., for the calibration of all the laboratory instruments where especial accuracy is required, among which may be mentioned the calorimeter thermometers and the pentane lamp.

2. *Control for Purification.*—Probably no other department of the works is more vital than the purifiers. It can be said also that the vigilance of the chemist should nowhere else be more strictly exercised. Owing to the varying percentages of sulphur in crude oil from different fields, the purifiers may be called upon most unexpectedly to handle greatly increased amounts of hydrogen sulphide. The purification control should include the following routine work:

A. *Daily Estimation of the Amount of Hydrogen Sulphide.*—There is no better rapid test for this purpose than the titration of the raw gas with a standard solution of iodine, of which 1 c.c. corresponds to 100 grains of sulphur per 100 cubic feet. The Tutweiler burette is very convenient for this purpose. The use of starch solution, as the confining fluid, may be used in place of mercury, providing that the titration be done at once upon collecting the sample. It will be necessary to make a blank test to ascertain the amount of the iodine solution to color the starch solution to the shade of blue which is to be used for the end point of the titration, which is to be deducted from the amount used to take up the hydrogen sulphide. When a number of purifiers are operating in series, the work performed by each box may be ascertained by making a series of tests in which every box successively occupies the same relative position.

It is possible, by this method of testing, to determine exactly what percentage of the total sulphur is being removed by each box. It may be found that a box showing foul in the first position may still be removing a large percentage of the total sulphur.

B. The condition of the material in the purifiers should also be ascertained by monthly analysis for sulphur, tar and cyanogen products. The following method has been found satisfactory for estimating on the same sample, moisture, total cyanogen and sulphur.

Ten grams of the oxide, which has been removed from the purifier at the close of the revivification and bottled, are weighed out into a watch glass and dried to constant weight in an air bath at 100° C. The loss in weight gives moisture, the same sample is now introduced in a Soxhlet extraction apparatus and extracted for 1 hour with redistilled bisulphide of carbon. The extract evaporated to dryness represents the sulphur contained in the sample, and should be melted before weighing. The residue of oxide can be used for estimating the cyanogen contents. The same is slightly warmed with a dilute solution of caustic soda, the solution cooled and made up to 500 c.c., of which an aliquot part is used. Make slightly acid, warm gently, and precipitate with a dilute solution of ferric chloride. The precipitate of Prussian blue must be washed several times by decantation and, finally, on the filter until free from chlorides, dried, ignited and weighed as ferric oxide, which can be calculated back to Prussian blue, in which form the cyanogen is to be reported.

Purifying materials used for oil gas may, with good management, be run up to as high a percentage of sulphur as in coal gas or water gas manufacture. The Prussian blue contents have a very important bearing upon the life of the oxide, because the iron present in the Prussian blue is permanently incapable of sulphur removal and also acts as a coating over the remainder of the oxide of iron. Samples of oxide used for oil gas have come under my observation containing as high as 10 per cent. by weight of Prussian blue. The estimation of tar in oxide should not be necessary in a well-equipped plant. The approximate estimation of the same can be carried out by treating the sample with solvents to dissolve out the tarry matters, which may then be evaporated to dryness.

To insure the freedom of the purified gas from traces of hydrogen sulphide, no more delicate test can be devised than the well-known sugar of lead test. It is possible, by using a revolving disk carrying a chart similar to a Bristol recording gauge, impregnated with lead acetate and dried, which is exposed to a tiny jet of the gas to be tested, to obtain a continuous record of freedom from hydrogen sulphide.

C. As is well known, the sulphur contents of oil gas are not limited to hydrogen sulphide. A large portion of the sulphur appears in an organic form, which, by reason of the difficulty attending its removal, would seem to have deserved more attention than has been given it. The presence of this impurity is not indicated by the sugar of lead test, and can only be estimated by a combustion of the gas. The analysis is conveniently carried out as follows:

A small jet of gas, burning at the rate of $\frac{3}{10}$ cubic foot per hour, which has been accurately measured by passing through a test meter, is kept burning in a glass flask of about 1 liter capacity, containing two openings. The side opening communicates with several wash bottles, filled with broken glass or marbles, and containing dilute caustic soda. The other opening of the flask is at the bottom and communicates with another series of 3 absorption bottles containing a solution of sodium carbonate, to which has been added a few drops of bromine. The outlet of these bottles is connected to a source of suction. By means of a 2-hole stopper the gas jet is inserted into the side opening flask. A rapid flow of air, purified by bubbling through the caustic soda bottle, is drawn through the flask and the sodium carbonate absorption bottles. The products of combustion of the gas, which contain the organic sulphur as sulphurous acid, pass with the air into the sodium carbonate bottles, where the sulphurous acid is oxidized by the bromine to sulphuric and retained by the sodium carbonate. After 1 to 5 cubic feet of gas have been burned, the sodium carbonate solution is transferred to a beaker and the bottles and flask well rinsed with distilled water. The solution, made slightly acid with hydrochloric acid, is precipitated with barium chloride in the usual way for estimation of sulphur, which is reported in grains per 100 cubic feet.

D. While not strictly to be classified as routine work, the differentiation of the organic sulphur compounds in oil gas bears such a close relation to the study of the subject that the work should be carried on more than intermittently. Good methods are not yet available to enable the gas chemist to report with certainty as to the nature of the various sulphur compounds present.

The absorption of bisulphide of carbon may be effected with alco-

holic potash. The alkaline solution is evaporated, dissolved in distilled water, and made slightly acid with acetic acid. A very dilute solution of copper sulphate is added, drop-by-drop, until a permanent yellow precipitate of cuprous xanthate is produced, which is allowed to stand and filter off. The precipitate is washed on the filter, dried, ignited and weighed as cupric oxide, from which the sulphur is calculated and reported as bisulphide of carbon in grains per 100 cubic feet. It is not certain that other sulphur compounds may not also react with the alcoholic potash.

It is desirable that a good method be worked out for the separation and estimation of mercaptans, the presence of which may be shown qualitatively by means of mercury compounds.

Thiophene and sulphocyanides have been found in oil gas, but not qualtitatively estimated. The subject is worthy of a good deal of investigation and good working methods for the separation and estimation of these bodies as occurring in illuminating gas would prove very acceptable.

3. *Control of Naphthaline Troubles.*—Owing to the high heats employed for making oil gas, naphthaline troubles are as much present as in either coal gas or water gas. Owing to the large amount of scrubbing water necessarily employed for the washing out of lampblack, the gas does not enjoy that full contact with tar and tar oils which might serve to reduce the quantity of naphthaline.

Happily, on the Pacific Coast, the problem is no longer perplexing. There are several plants at present equipped with scrubbers for washing the gas with crude oil. Where this method is employed, naphthaline troubles are practically unknown. Where the chemist is called upon to determine the amount of naphthaline present in the gas, he is likely to be confronted with analyses showing quite variable amounts of naphthaline. It is my opinion that the analysis itself is not at fault, and that the fluctuations observed are actually present. The method employed is as follows:

The sampling is done by inserting into the main, to a point about ¼ of the diameter, a glass tube, bent to a right angle at one end, which is pointed in the direction of the flow of gas. The other end communicates with a Petenkofer tube for absorption with standard picric acid solution. The tube consists of a piece of glass combustion tubing, about 3 feet long, sealed at one end; the other end is slightly widened to receive a 2-holed rubber stopper. The tube leading to the gas from the main is carried, without joints, through the stopper to the other end of the Petenkofer tube and is drawn down to a fine opening. The outlet of the apparatus communicates with a test meter for measuring the volume of gas used and is placed at a slight angle from the horizontal. A measured amount of the picric acid solution is run out from a burette into the apparatus, the same is connected up to the main and about 5 cubic feet are bubbled through slowly. The picric acid is then transferred to a rubber stoppered bottle which can be exhausted of a part of its air. The bottle and contents are heated in warm water until the naphthaline precipitate is dissolved. The solution is allowed to cool over night, the precipitate being filtered off and washed with as little as possible cold water. The picric acid is now titrated against a standard caustic soda solution. The loss in picric acid is calculated back to the naphthaline equivalent and the same reported in grains per 100 cubic feet.

The picric acid solution may be used qualitatively, to indicate the presence of large or small amounts of naphthaline by bubbling some of the gas rapidly through a test tube containing a few c.c. of this solution. Should no precipitate appear after 2 minutes' bubbling, the gas may be taken as being reasonably free from naphthaline.

4. For the purpose of checking up on the control for illuminating and calorific values, and for the study of operating conditions, the daily gas analysis is invaluable. The analysis should be made with a Hempel apparatus. It is fully as rapid as, and much more accurate than most of the other different forms of gas analysis apparatus. A slight modification of the usual burette enables the potash pipette to be permanently attached to one of the openings of the 3-way stopcock, effecting a slight saving in time and decreasing the liability and introducing caustic potash into the burette.

There has been considerable controversy during the past few years as to the accuracy and proper manipulation of the nickel cyanide absorption method for benzene vapors. The method of Dennis and O'Neil is probably accurate under the conditions specified by them. The separate estimation of benzene is unavoidable where one desires to calculate the calorific value of the gas. Fuming sulphuric acid should be used for the ethylene absorption. The estimation of oxygen should be carried out by means of stick phosphorus.

An acid solution of cuprous chloride for carbon monoxide determination is preferable to an ammoniacal solution, because of the liability of the latter to stop the capillaries of the pipette. By washing the cuprous chloride with a dilute solution of hydrochloric acid before making up, the same can readily be reduced to a water-white solution by means of copper strips. It is advisable to store a part of the residue from the carbon monoxide determination in the cuprous chloride pipette, and to duplicate the explosion for estimation of hydrogen and methane. The following figures are in use in this laboratory for the calculation of calorific value—it is well to remember in this connection that heating values which are right at 0° F. are wrong at 60° F.:

Constituent.	Per Cent.
Benzene	3,807.4
Ethylene	1,588.0
Carbon monoxide	523.5
Hydrogen	326.2
Methane	1,009.0

There is no reason why calculated and observed values for calorific value of gas should show any great discrepancies, providing samples for gas analysis and calorimeter tests are taken simultaneously. The interpretation of the gas analysis may afford, in the hands of one thoroughly familiar with the manufacture, a very valuable means of operating control.

The presence of a high percentage of carbon dioxide and carbon monoxide is a sure indication of low heats caused by a foul machine or by an excessive water content of the crude oil. The percentage of oxygen should be closely watched in case a small percentage of air is being continuously admitted into the gas for purification purposes. A high percentage of hydrogen shows that the superheater heats are being carried too high.

Gas analyses should be made occasionally of the blast products, and it may be found that a great deal of combustible matter is being allowed to escape for lack of enough blast pressure. The flue gases from the boilers may be analyzed in the same way for regulating the dampers and condition of the fires.

It is a matter of considerable importance to ascertain the amount of physical impurities remaining in the gas at different stages of the manufacturing process. These impurities, consisting of tar or a tarric pitch and a certain amount of lampblack, must be thoroughly removed by the water and shavings scrubbers before entering the purifiers.

The analysis is conveniently carried out as follows: A calcium chloride U-tube is filled with cotton or mineral wool, and placed in an air bath connected to a source of suction, the temperature being maintained at 100° C. A current of air is drawn through the apparatus until the tube attains a constant weight. The apparatus is now ready for the test. It is connected up, by means of a piece of glass tubing and a rubber stopper, as close as possible to the main, a sample of the gas being passed through the tube, then into a test meter for measuring the volume of the sample. It is advisable to take a large quantity of gas for the sample, in fact the amount will depend upon the position in the works. More will be required at the inlet to the purifiers than at the inlet to the relief holder. The tube is again placed in the air bath and dried in the same way to constant weight. The increase represents the physical impurities of the gas, which are reported in grains per 100 cubic feet.

Should it be desired to differentiate the nature of the impurities, the cotton or mineral wool may be removed from the tube and extracted with alcohol. The loss represents tarry matters. The difference between the weight of the tarry matters and the total amount of the impurities is equivalent to lampblack.

The amount of cyanogen compounds present in the gas may be estimated by bubbling the latter through a series of wash-bottles containing a mixture of caustic soda and copperas solution, by which the cyanogen is taken up. The solution is made acid with hydrochloric acid, and it may be necessary to remove sulphur with barium chloride before precipitating the cyanogen with ferric chloride, as Prussian blue, which is filtered off, washed till free from chlorides, dried, ignited and weighed as ferric oxide, from which the amount of cyanogen is calculated. The same is reported as hydrocyanic acid, in grains per 100 cubic feet.

5. *Control of Operating Conditions and Technical Report.*—It is often the practice of medium-sized works to include, in the daily routine of the chemist, the collection of miscellaneous works' data, consisting mainly in the observation of temperatures and pressures around the works. No better method can be taken for rapidly initiating the young chemist into the operation of the works, with

out which knowledge the value of his work is greatly reduced. This practice is open to the objection of taking up a great deal of time from the regular laboratory work; but, when thoroughly familiar with all the details of the manufacture through daily contact in this manner, the chemist becomes of a great deal of assistance to the foreman or superintendent. He may well be intrusted also with the preparation of the daily manufacturing report. The concentration, in the hands of one man, of all the technical data connected with the operation, enables a better study of the same to be made and relieves the operating head of an enormous amount of work which is preliminary to improvements in operating methods.

6. *Valuation of Raw Materials.*—The valuation of raw materials in the laboratory may be the means of effecting large economy in operation. The most important manufacturing material is, of course, crude oil. This material is usually examined for specific gravity, viscosity, sulphur content and percentage of water and sand. The Beaume scale is generally made use of for reporting specific gravity, and it is very seldom necessary to use a more delicate method. In this connection the following corrections[1] for temperature may be found useful.

Temperature Correction for Beaume Hydrometer.

From 10°–20° B.,	add or subtract	.065	B. per 1° F.,	under or above	60°	F.
" 20°–35°	" "	.070	"	"	"	
" 35°–45°	" "	.075	"	"	"	
" 45°–55°	" "	.080	"	"	"	
" 55°–70°	" "	.085	"	"	"	

The viscosity of crude oil is really of nearly as much importance as the specific gravity, for the reason that the pumping capacity of the plant depends a great deal upon this factor. The efficiency of the burners in the generators may also be affected by a change in the viscosity of the oil. The percentage of sulphur in crude oil is a matter of the greatest importance. It is the duty of the chemist to subject the oil to examination for this impurity as soon as received, in order that provision may be made to cope with an unduly high percentage of hydrogen sulphide in the gas. The analysis is most conveniently carried out by exploding in a bomb about 1 gram of the oil thoroughly mixed up with about 15 grams of sodium peroxide. The residue from the explosion is dissolved in water, made acid with hydrochloric acid, filtered free from lampblack and precipitated with barium chloride in the usual way. The amount of sodium peroxide to be used is gauged according to the appearance of the products of explosion. A residue of oil, or the presence of much carbon in the bomb, shows insufficient peroxide, while an excess may prevent a successful and complete combustion. The method is a modification of the Sundstrom method for the estimation of sulphur in coal and was written up for an early edition of the "Purifier," a defunct organ of this Association, by Dr. P. W. Prutzman.

The percentage of sulphur in the crude oil bears a definite relation to the percentage of hydrogen sulphide and organic sulphur in the raw gas. It may be stated roughly that every 1 per cent. of sulphur in the oil will be responsible for from 250 to 300 grains of hydrogen sulphide and from 30 to 35 grains per 100 cubic feet of organic sulphur in the unpurified gas. California crude oil has come under my observation containing 3 per cent. and over of sulphur. An oil so high in sulphur will give rise to from 750 to 800 grains of hydrogen sulphide and nearly 100 grains of organic sulphur per 100 cubic feet.

The percentage of water in crude oil is generally estimated by treating with gasoline in a graduated cylinder, allowing the water to settle out to the bottom where the percentage is read off directly. It is usual also to include in this percentage the amount of sand or sludge which settles out at the same time. The inaccuracy of this method is so great as to make the test absolutely usless as an indication of the amount of water contained in the crude oil. The percentage shown amounts to ½ or ¼ the actual contents.

Most oil contracts provide for a water allowance of anything over 2 per cent. It is strongly urged that the distillation test be specified in all agreements for the purchase of oil, failing which, gas companies are likely to be heavy losers. The distillation method is carried out at follows: 100 c.c. of the sample are measured out in a graduated cylinder and transferred into a distillation flask, which is connected to a condenser—the thermometer may be omitted. The distillate is received into a graduated cylinder of about 15 c.c. capacity, which is drawn out at the foot so that the divisions may be more easily read. The distillation is interrupted as soon as the water is all off, which is readily noticed by the change in the appearance of the distillation. The water and light oils coming over separate sharply in the receiver and the percentage may very readily be determined within $\frac{1}{10}$ of a per cent. The whole operation barely requires ½ hour. To avoid breakage the distillation flask may be made of metal. It is advisable in that case to heat the same with a ring burner from the sides. The distillation will then proceed quietly and without bumping.

How much the percentage of water may affect the operation results is not generally realized. Therefore, I show the accompanying diagram illustrating the same. It will be seen how many of the ups-

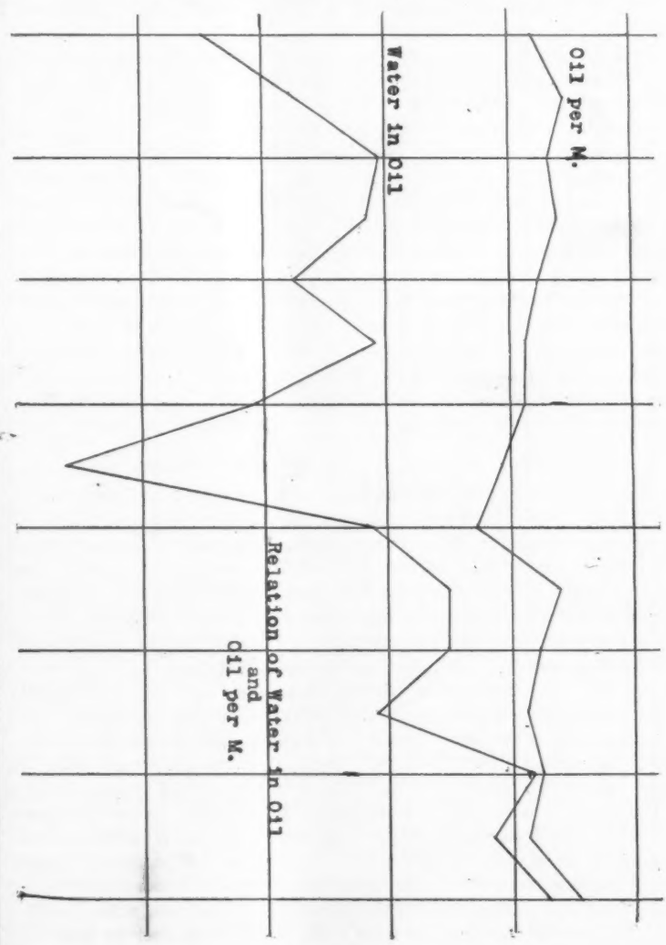

Fig. 3.

and-downs in the oil per 1,000 may be traced to the water contents of the oil. For a study of the nature of the crude oil a complete distillation is interesting, and the residuum is somewhat of an indication of the value of the oil for gas making purposes.

Next in importance to the oil is the selection of a good firebrick which will stand the hard usage incidental to oil gas manufacture. The well-known methods for the analysis of clay may be used for firebrick analysis. The important constituents are silica, alumina and iron. Alumina and silica are of refractory nature, while iron increases the fusibility. It is possible, by analysis, to narrow the choice of a suitable brick down to a few good samples, which can then be subjected to practical physical tests to determine their suitability. A trial order, for enough brick to supply one machine, will furnish means for a final valuation under operating conditions. A record maintained of such successive brickings will enable the selection of the best in the market.

The quality of the offerings is sincerely to be deplored. I had occasion, quite recently, to make analysis of some 20 samples of firebrick from various firms in this country and abroad, and regret to say, that, of the lot, only ½ dozen contained less than 5 per cent. of iron. A prominent manufacturer recently made the statement that he was forced to cater to the desires of his customers who refused to pay the price necessary to make a good brick. I show below a few analyses of representative firebrick:

1. I am indebted in this and other instances to Dr. P. W. Prutzman, who is generally recognized as an authority on this subject.

		Per Cent. Silica.	Per Cent. Iron.	Per Cent. Aluminum.
1	Foreign.....	54.5	10.5	35.0
2	"	57.9	4.5	37.6
3	American.....	59.2	2.3	38.5
4	"	68.3	2.5	29.2
5	"	59.0	3.7	36.8
6	"	58.3	9.0	27.9
7	"	73.2	3.6	22.6
8	"	78.2	3 3	17.7
9	"	52.8	5.9	41.3
10	"	60.4	5.5	32.0
11	"	69.8	5.8	26.4
12	"	61.7	7.7	30.6
13	"	59.4	8.3	26.4

Lime for purifying material should be analyzed for purity and purchased on the basis of cost per barrel of pure calcium oxide. It may be found that, for the manufacture of purifying materials, some of the dark colored lime, containing more impurities, may be cheaper for the purpose on the basis of calcium oxide content and yet satisfactory. The same may be said of copperas.

Although an elaborate equipment is needed for the valuation of lubricating oils, yet a few simple tests in regard to viscosity may enable the selection of suitable oil for the different machinery. Should it be desired to go further into the subject, it is possible to install a home-made device for determining the coefficient of friction. It is possible also, by temperature readings on one particular bearing, in conjunction with a record of the amount used, to ascertain the practical efficiency of an oil in actual work.

7. *Experimental Work.*—Having taken all the precautions for maintenance of the quality, it now becomes the duty of the oil gas chemist to ascertain, if possible, what conditions of manufacture will produce the required quality with the least possible expenditure of oil.

The question has often arisen in my mind whether it is cheaper to enrich a very lean gas, high in hydrogen, up to the required value by means of very rich hydrocarbons; or, whether it is better to maintain a rather more uniform composition. The problem is very complex, and by no means depends upon the ultimate analysis of the gas (*i. e.*, the percentage of carbon-hydrogen), but rather upon the way in which the same are combined to make up the different hydrocarbons. This results from the fact that it is quite possible to combine the same amounts by weight of carbon and hydrogen into hydrocarbons and combinations of hydrocarbons having widely different illuminating and calorific values. In other words, the several possible combinations of the same amount of carbon and hydrogen require different expenditures of energy. It follows that the combustion of these bodies will likewise liberate different amounts of energy.

Practically, of course, it is impossible in operating to produce any particular hydrocarbon to the exclusion of others. However, these various members of the same family are generally produced under much the same conditions. We may, therefore, study operating conditions with a view to producing the maximum of that particular family which gives the highest operating efficiency. It is well to bear in mind that, while we are able to store up varying amounts of energy into the hydrocarbons, the same must of necessity be either furnished from the energy of the oil used for heating the sets or from the waste energy of the by-products.

Concerning the better utilization of the heating oil, the problem depends upon the following factors:

1. Quality of checkers; 2, spacing and arrangement of checkers; 3, investment and labor charges due to capacity of set.

Concerning the quality of firebrick, it cannot be too much emphasized that the best is by far the cheapest from any standpoint. It is to be regretted that the best quality of firebrick is not more generally used. A firebrick must have sufficient conductivity and heat capacity to efficiently store up heat, and the ingredients and workmanship must enable it to stand up to the work. All generator control is absolutely useless without this prerequisite.

Assuming, therefore, that the brick are the best obtainable for oil gas, they must now be arranged in such manner as to offer the greatest posssible surface to the heat of the blast and the proper breaking up of the crude oil. This can only be obtained by complete baffling or staggering. The practice obtaining in some localities, of laying the checkers in straight flues, cannot be too strongly condemned. It is simply a confession that the amount of making oil per run has not been correctly gauged. The spacing of the checkers must be likewise set according to the quality and amount of the making oil. With heavier oils it may be necessary to carry the generator checkers much farther apart in order to prevent excessive fouling. The amount of making oil will depend upon the amount of blast pressure available for heating it and the temperature which it is desirable to carry. The more making oil used per run the wider must be the spacing of the checkers and the lower the thermal efficiency of the set. This brings us to a consideration of the investment and labor charges due to the capacity of the set. It is undeniable that, in contemplating many changes that would tend toward greater operating efficiency, we are confronted with the capital investment. While very slight reductions in cost of operation will pay several times over for the increased labor and capital charges, it is doubtless true that the capital may not always be available. Changes can, therefore, only be made up to the excess generating capacity. With the heating oil used to the best advantage we have a definite amount of heat stored up in the checkers, to be utilized in making the maximum amount of gas of a certain quality.

We will now discuss this point from the standpoint of the 2-shell machine, composed of generator or primary shell and secondary or combined carburettor and superheater. It is now desired to divide the total amount of oil between the two shells with a view to—

a. Producing the most gas of the desired quality from the least amount of oil.

b. Maintaining the checkers in the best shape.

It is only by diminishing the calorific value of the by-products that we can increase that of the gas produced. Now, inasmuch as the lampblack made is fully utilized in the production of steam or in the manufacture of briquettes, we do not care, therefore, to draw upon that source; moreover, carbon tends also to increase the specific gravity of the gas and thereby lessen the capacity of the mains. It is the carbon in combination with hydrogen, passing off as tar or pitch, that we wish to retain. In so doing we would eliminate the greatest nuisance incidental to oil gas manufacture. We must, therefore, operate to eliminate tar and pitch. Tar and pitch are produced at the latter part of the runs; lampblack at the beginning. To eliminate the two first we must stop the run with the appearance of tar, while, in order to produce the required quality of gas, we must do away with the high heats of the initial part of the run. We thus arrive at the old water gas idea of short runs and blows, to which, of course, there is an economical limit due to the time lost during changes and purging set.

By avoiding on the one hand the high heats which tend to melt the checkers, and on the other hand the low heats that cause an accumulation of carbon in the spaces, we tend to increase the life of the checkerwork. By analyses and compilation of data the chemist should be able to advise changes in operating methods which should always be carried out singly in order to be sure of the cause of any observed result.

It is well for the chemist to carefully study the efficiencies and losses of different parts of the manufacture, both thermal and mechanical, as this forms the basis for all improvements. For this purpose, careful measurements should be made of all the materials and energy entering and leaving various portions of the works. There is no better example of such work than is contained in that remarkable paper, "The Practical Efficiency of a Water Gas Set," by Capt. W. E. McKay, of Boston, Mass.

Appliance Work and Illumination Photometry.—The chemist is often the only scientific man on the manager's staff and may, therefore, be expected to render assistance whenever trained observation and a good knowledge of scientific principles are likely to be of use in solving any particular problem. He may be expected to gauge the capacity of appliances or regulate the burners on same or in other ways introduce scientific ideas into other departments than the works. In this connection he may be called upon to pass upon the respective merits of various brands of mantles or aid in illumination work, both of which he is qualified to handle in connection with bar photometry work.

In concluding this paper, I wish to say I have purposely omitted many details which are readily available in the text books, and wish to especially call attention to the excellent instructions that have been brought out by the American Gas Institute for the "Standardization of Photometry and Carlorimetry."

THE proprietors of the Cortland and Homer Gas Company, of Cortland, N. Y., have offered to institute a flat rate of $1.40 per 1,000 for gas, for the rate on sliding scale plan which is favored by Mayor Barry.

[Communicated.]

The Lynch-Paul Improved System of Steam Generation.

About 2 years ago Mr. John H. Lynch, a well-known manufacturer, whose shops are in Matteawan, N. Y., having thought over the matter for quite a while, began actively experimenting along the line of coal consumption in furnace work for steam raising. Starting with the knowledge that ordinary combustion furnaces are far from perfect, and that the gases passing over the bridge-wall to the rear of the boiler were, to a large extent, unutilized, and also that, after the gases had left the furnace, condensation would take place with the necessary lowering of the flame temperature, making it impossible to mix the gases at the rear of the furnace with the oxygen in the air, and thus produce perfect combustion, he sought some practical, simple method for producing perfect combustion, in such a way as to allow getting the complete availability of the heat which might be produced from actual (or substantially actual) perfect combustion. Of course, it also became a question with him then as to the ignition of the gases. In his ponderings over the subject he counselled with Mr. Wm. J. Paul, also of Matteawan, N. Y., and the latter suggested to Mr. Lynch a practical method of securing the result.

Mr. Paul began with the examples of the Bunsen and Welsbach burners. The former, of course, combines the air and gas at the bottom of the tube, combustion taking place at the top of the tube. In this case, while the combustion is complete, there is no heat in the tube forming the mixer of the Bunsen.

The method followed in the Welsbach burner, which is well known to have virtually revolutionized former gas comsumption practice, is identically like that in the Bunsen burner, viz.: The mixture of air and gases being in bottom of the tube, the gases being thus confined within the mantle, combustion takes place within the area of the mantle, and there is obtained a much higher degree of heat for producing the illumination which is yielded by the Welsbach burner.

It was seen that the adoption of this plan in boiler practice, could it be made practicable, must bring about similar results to those which were attained in the instance of the Welsbach burner. They, therefore, conceived the plan, shown in Fig. 1, herewith. The tubes, which are made of a mixture of fireclay and silica, or other material which can withstand high degrees of heat without destruction, are placed at or near the bridge-wall, and in free communication with the furnace itself. They are then conducted underneath the boiler, and placed upon rests in a position at or near the rear end of the boiler. These tubes are made as thin as possible, consistent with withstanding the heat, being separated from each other laterally, so that the heat which is produced by the combustion of the gases within their area circulates freely from the exterior of the tubes to the shell of the boiler.

Fig. 2 shows the front end of the boiler with the tubes in position. From the top of the bridge-wall to the bottom of the shell of the boiler, the tubes are placed in position, so that neither gas nor air can reach the rear of the boiler without first passing through the tubes. The passage of the air and gases in the tubes with the heat from the furnace ignites the gases, which combustion heats the tubes to incandescence. The subsequent gases passing into the tubes are burned, an intense heat being produced.

At a recent experiment made at the Southern Dutchess Electric Company's plant, at Matteawan, as shown, in the rear combustion chamber, a temperature of 1,400° was reached, this resulting after a very much higher temperature had been evolved under the boiler, between the bridge-wall of the furnace and the rear end of the tubes, which, in this case, ran some 60 inches from the bridge-wall. This intense heat was radiated to the shell of the boiler, and the gas which had passed into the rear combustion chamber from the furnace had become a fixed gas. There was no further chance for condensation, and the only possible lowering of the flame temperature which might occur was that which took place in the radiation of heat to the tubes of the boiler and in coming into the stack. The stack temperature in this experiment did not at any time exceed 400°, and from that went as low as 320°, so that the amount of heat which radiated to the boiler was over 1,000°.

The theory the investigators had in mind as to this practice was first worked out by them. Then the actual results in everyday practice were carefully noted, with the result that it seems their original ideas have been thoroughly established.

It is a well-known fact that the only method of conveying heat through water in the interior of a boiler is by convection. The circulation in the interior of the ordinary return tubular boiler has been of two kinds—what would be called "lateral" from the center to the sides, and "longitudinal," or in a contrary direction to the line of draft. Of course, the explanation of this is very simple.

Heretofore in boiler practice the greatest amount of heat has been applied to the boiler, at the front end, over the furnace. The water at this spot being highly heated, the more dense volume of water from the rear of the boiler has taken place of the expanded portions over the furnace itself. Thus, the longitudinal circulation has been started and maintained. This circulation, coming in contact with the lateral circulation, has created a friction, which must certainly interfere with the rapid circulation of water in the interior of the boiler. The heat, as applied in the method as now claimed, is distributed (almost entirely) evenly under the entire length of the boiler, which, to an almost absolute extent, eliminates the longitudinal circulation, leaving only the lateral. The friction between these two currents being reduced, or almost entirely eliminated, there is produced a more rapid circulation within the shell of the boiler; and it is a well-known fact that the efficiency of a boiler depends upon the rapidity of the circulation. In no other way does it seem to the inventors of this system can a reasonable explanation be found for the marvellous results which, after considerable careful experiments, under ordinary practice and under conditions which were not at all favorable, have been produced.

The first experiments were made with a 150-horse power boiler at the silk mills of Mr. John H. Lynch, one of the inventors. His mill was getting not over 50 per cent. of the rated horse power of the boiler installation.

CONCISE STATEMENT SHOWING WATER EVAPORATED PER POUND COAL. —*Type of Boiler Used for Following Test: 6-Foot by 16-Feet; Return Tubular. Coal, Poor Grade Buckwheat. Apparent Evaporation from and at 212° F.*

No. 1.	May 2, 1910.	Water evaporated per pound coal	10.42
	" 3, "	" " " " "	10.51
	" 4, "	" " " " "	10.75
	" 5, "	" " " " "	10.50
	" 9, "	" " " " "	11.09
	" 10, "	" " " " "	11.09
	" 11, "	" " " " "	11.07
	" 12, "	" " " " "	10.69
No. 2.	Coal, good grade bituminous.		
	May 16.	Water evaporated per pound coal	11.62
	May 17.	" " " "	12.10
No. 2.	Type boiler used, 6 feet by 18 feet; return tubular.		
	Coal, fair grade buckwheat.		
	Oct. 1, 1910.	Water evaporated per pound coal	12.63
No. 3.	Coal, good grade bituminous.		
	May 8.	Water evaporated per pound coal	14.03

As may have been expected the testings at the start were various. As will be seen several grades of coal were used, running from a poor grade of buckwheat to a good grade of soft coal. The results, as to the amounts of water evaporated under these conditions, are presented, and can be seen and studied.

The next test, which was made at the plant of the Southern Dutchess Gas and Electric Company.

This test was made with conditions more favorable. In this article is shown a photograph (Fig. 3) of the stack used for the boiler under which the test was made. As will be seen, 12 feet from the top of the stack a serious break appears in same. The entire stack itself is but 36 feet in height, so that really there is not much more than 24 feet of stack, 86 inches in diameter. This boiler was run under a natural draft, a steam jet being inserted in the stack—the steam jet was a home-made product, and not by any means perfect. The following results were produced:

Record of Evaporative Test Made October 8, 1910, with Bituminous Coal, at Southern Dutchess Gas and Electric Company's Plant, Mattewan, N. Y.

Type of boiler	Return tubular.
Size	6 feet by 18 feet.
Grate surface	42 square feet.
Duraeion of test	17 hours.
Condition of fire at start	Clean, 3 inches.
" " " finish	Burned to 3 ins.
Pounds of water evaporated	73,150.
" " coal fired	5,700.
" " ash recovered	500.
Average steam pressure	8,756.
" temperature feed water	175°.
" " boiler room	80°.

In connection with the operation of the boiler under which the test was made, two other return tube boilers were used, rated at 80-

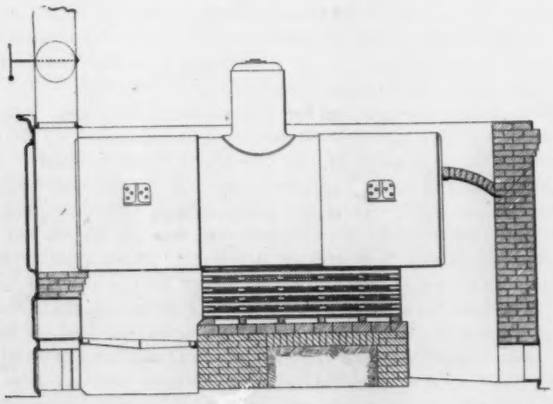

Fig. 1.

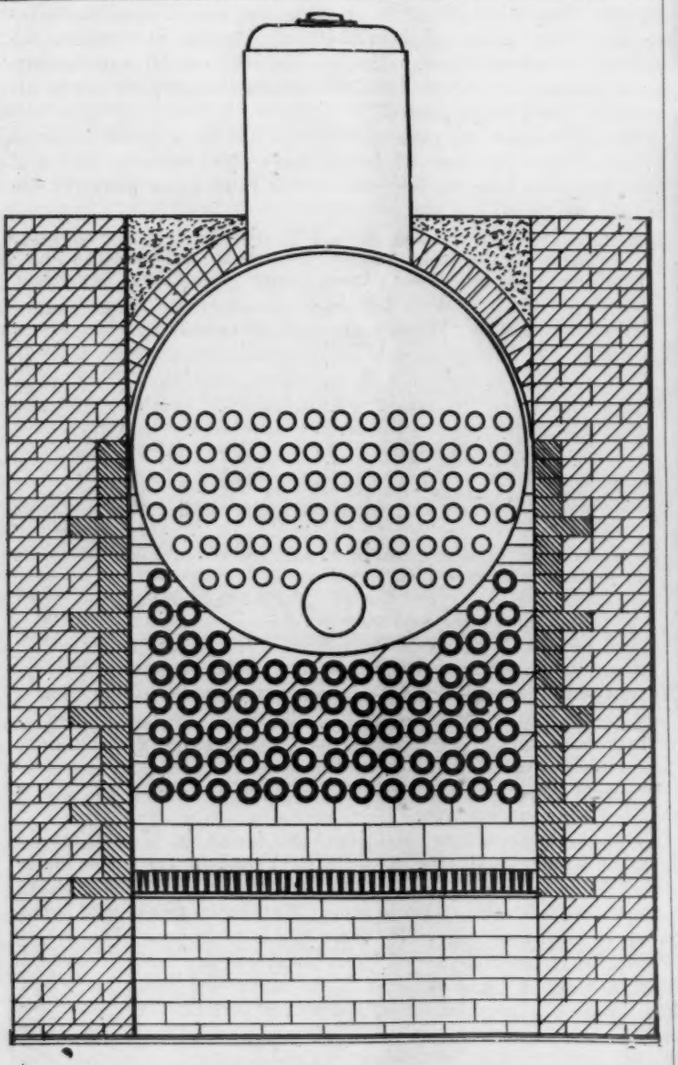

Fig. 2.

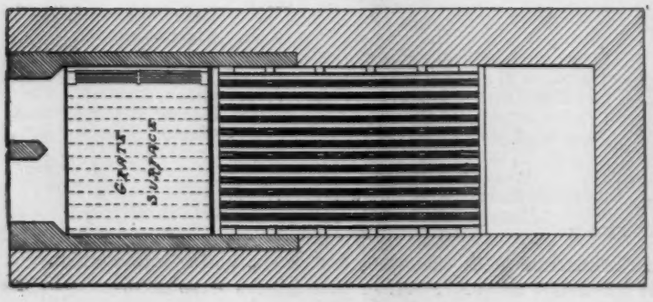

Fig. 3.

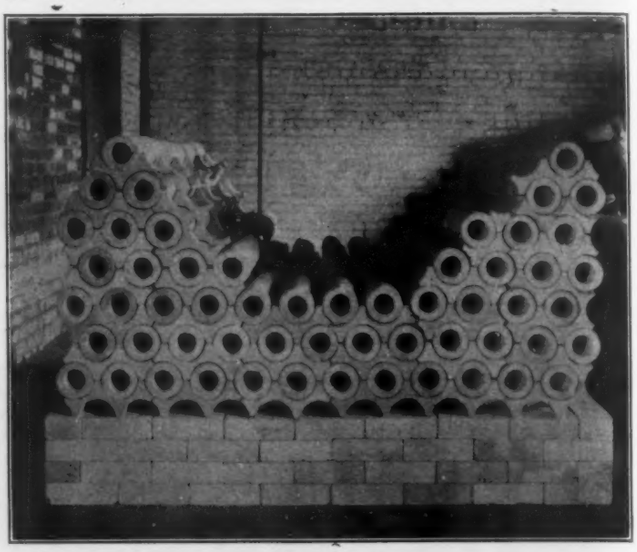

Fig. 4.

Fig. 5.

Fig. 6.

horse power each, under each of which had been placed one of the installations set forth in this article, and, in addition thereto, 2 water tube Taylor boilers of 250-horse power each, under which no installation was placed. The 2 Taylor boilers, with the two smaller return tube boilers, have a blower system.

The plant of the Southern Dutchess Company has, in addition to its steam supply, a considerable water power used in connection with or to eke out the regular steam supply. Large units have been added from time to time to the Gas and Electric Company's plant which consume the current, consisting of extra lighting areas, power for the inclined railroad on North Beacon Mountain, and various other sources, which have taken much more power than was originally intended to be cared for by this plant. Additions to the steam plant have been made rather slowly, so that when the load was heavy upon the plant, which occurs on Saturday and Monday evenings, it was almost impossible to operate this plant with the steam alone, five boilers being pushed to their utmost capacity. In fact, Mr. John T. Smith, President of the Company, has stated it was almost impossible to run the plant with steam power alone when the heavy load was on.

On the night of Saturday, October 1st, 1910, with a fair grade of buckwheat coal used under all the boilers, the entire plant was run with the five boilers without water power.

Record of Evaporative Test Made October 1st, 1910, at Plant of Southern Dutchess Gas and Electric Company, Matteawan, N. Y. Fair Grade Buckwheat Coal.

Type of boiler	Return tubular.
Size	6 feet by 18 feet.
Grate surface	36 feet.
Duration of test	12 hours.
Condition of fire at start	2 inches, clean.
" " " finish	Burned to 2 ins.
Pounds, water evaporated	30,785.
" coal fired	2,949.
" ash recovered	512.
Average steam pressure	90 pounds.
" temperature feed water, Degs. F.	172.
" " boiler room, Degs. F.	85.

On October 8th, 1910, another test was started, beginning at 7 o'clock Saturday morning, and continuing until 12 o'clock Saturday night. In this test a good grade of soft coal was used under the large return tube boiler, a fair grade of buckwheat coal being used under the other 4 boilers. After the test was started, and had been continued until about 7 : 30 o'clock in the evening, the two smaller boilers were entirely cut off from the steam line by closing the valves. The entire plant was then operated with the two Taylor boilers, and the one large return tube boiler, with this installation, burning the good grade of soft coal. A like result had never been accomplished at this plant, and mention is made of this merely to show the effectiveness, in actual operation, which has resulted from the installation of the device here described.

The last mentioned test was made under the 170-horse power return tube boiler, October 8th, 1910, with a good grade of bituminous coal, secured from the plant of the Dutchess Tool Company, Fishkill Landing, the coal being of the sort used by them in their ordinary manufacturing operations.

The results in evaporation have been such that it has caused the gentlemen interested in these installations to be most careful and particular in the measurements of the water evaporated and of the coal used—the boiler itself was doing its full quota of work, and more, as above stated.

The water in the boiler under test was kept at a little over one gauge, so as to insure a perfectly dry steam. In fact, the plant could not have been operated if the steam was not perfectly dry, for every ounce of power was needed for the 3 boilers which were used to operate the plant.

Respecting the illustrations presented with the accompanying article, No. 1 is a sectional side view of the boiler, with the tubes in place. No. 2 is a front view, with the installation in place. No. 3 shows the method of placing the tubes from the furnace to the rear end of the boiler. No. 4 represents a front view of the tubes set up about as they are installed under the boiler. No. 5 is a side view of the same, showing the space between the tubes which allows the heat to radiate freely from the tubes to the boiler shell.

Experiments have been made with various lengths of tubes, and it has been found necessary to vary the same in accordance with the length of the boiler. Various diameters of tubes have been used: 2 inch, 2½-inch, 3-inch, and even larger. It has been found that, where the area from the bridge-wall to the bottom of the shell of the boiler will permit, the 2-inch tubes are most efficient, for the reason that gas, being a poor conductor of heat, the small volume into which the gases can be separated allows the heat from the tubes to penetrate to the center thereof, thus producing a more perfect combustion.

Very comprehensive patents were granted to Messrs. Lynch, Paul and Meyer, covering the claims under their system, and applications have also been filed in 18 foreign countries, and these patents fully protect the method and appliance used. In the original study and experiment, and before any tests were made, it was thoroughly well understood that checkerbrick work and perforated bridge-wall construction had been tested without results.

In the appliance above set forth, the gases are confined in intimate relation throughout the entire area of the tubes, perfect combustion taking place, a fixed gas being emitted in the rear of the tubes for circulation through the boiler tubes. The heat of the tubes is radiated freely to the shell of the boiler and a degree of heat is delivered to the entire boiler such as has never been done before. Not only has the rate of combustion been largely increased, but also the rate of radiation; these two factors being large elements in producing efficient boiler results. As the patent examiner very sagely remarked (after a careful examination of these claims): "Heretofore, when attempts had been made along these lines, when combustion had been secured there had been no radiation, and when radiation had been secured there had been no combustion, but this plan had solved the problem."

The claim is made, without fear of contradiction, that results in evaporation have been attained which it is absolutely impossible to obtain, or even approach, under present methods, and this evaporation has been produced with the expenditure of less coal than has ever before been found possible. The idea is entirely new, and the results claimed revolutionary.

The installations are now in operation at the plant of the Southern Dutchess Gas and Electric Company, at Matteawan, N. Y., to which everyone desiring to investigate are invited for an examination and a test, if necessary, to prove the working and the results thereof. Other installations will be made soon. The inventors know that these claims will meet with doubt, but with careful and close trial, they are prepared to meet both the doubt and the examination, and extend a courteous invitation to anyone desiring to visit the plant above named and learn for themselves what the results are.

To anyone interested, all further data pertaining to temperatures, pressures, duration of tests, conditions, etc., in connection with these, will be furnished on application to either Mr. Lynch or Mr. Meyer, at their Matteawan (N. Y.) address.

Practical Illumination.

During the Congress of the British Royal Sanitary Institute, which was held in Brighton, England, the second week in September, Mr. John Darch read a paper having for its title, "The Eye as It Affects Practical Illumination." In it the author noted that the conditions—at once those of daylight, and those essential to good artificial illumination—are: (*a*) A sufficiency of light; (*b*) perfect steadiness; (*c*) effective diffusion and freedom from violent contrasts; (*d*) a downward direction and preferably oblique; (*e*) the color to be as white as possible. However readily these conditions might commend themselves, it was not too much to say that they were violated in nearly every lighting installation in the kingdom—whether of gas, electricity, or what not. That nature's conditions of lighting were the best was shown by the fact that myopia is unknown in savage life and extremely rare among seamen and farmers, more particularly in the case of those whose childhood was spent in the open. Defective vision is the outcome of an ill-regulated civilization, and it was estimated that about half the studious and close working classes were sufferers therefrom in one way or another. Insufficient lighting in schools, offices and workshops was largely responsible for the increase of myopia, astigmatism and many attendant nerve troubles; but, so far as artificial lighting was concerned, the ever increasing brilliancy and cheapening of light, properly applied, made the remedy easy. For reading and ordinary work, there should be an illumination of 0.8 to 1.5-foot candles, for drawing and fine work, 3 to 10-foot candles.

High brilliancy in lighting did not, in itself, deserve the hard words which some had applied to it. Like all other forms of energy, light was a good servant but a bad master; it was a source of health and pleasure, and the more they had of it under control the greater the possibilities of good results. But glare from ill-placed and ill-tempered lighting was responsible for much suffering. The dazzling effect of a source of light might be due to (1) its intensity, (2) its composition, (3) its contrasts. A question still open for settlement was the maximum intrinsic brilliancy from any point or surface (and it was the intrinsic brightness and not the total flux of light that counted physiologically) that might be continuously and safely gazed upon.

Dr. Louis Bell gives 5-candle power, and Dr. Stockhausen 4-candle power per square inch as the maximum permissible brightness from a hygienic point of view; but Woodwell (U. S. A.) gives 0.2 to 0.1. The author was still of opinion that 0.05-candle power per square inch was the maximum intrinsic brightness that one might gaze on continuously. For short periods, however, 0.1 might be comfort-

able. All lights should be rigorously precluded from the field of vision, or, if translucent screens be used, these should not transmit more than 0.05-candle power per square inch.

Bad lighting was invariably due to the absence of suitable and sufficient reflecting surfaces. If the whole expanse of the sky was needed for the diffusion of sunlight, surely every inch of the ceilings and walls should be made to do similar duty and to yield at least 50 per cent. of its incident light. This would give the greatest amount of the most agreeable and serviceable of all light—diffused. The eye, alone, was incapable of judging actual intensity in lighting, and some reliable means of ascertaining such intensity was essential to the most elementary proceedings.

The need for legislation in respect of adequate lighting had long been felt. Something had been done in the Factory Act Regulations of 1908—requiring that certain rooms shall be "efficiently lighted." Such an expression was, however, indefinite and difficult to enforce, and, until the amount of light to be supplied could be stated in terms of standard units, such legal enactments offered little hope of success. This should present no difficulty, as we now had convenient and portable instruments, known as illuminometers, for measuring and indicating in foot candles the amount of light falling on a desk, bench or other surface. They were at present mostly in use by street lighting engineers; but one should be in the hands of every factory and school inspector, and every architect desiring good natural and artificial lighting in his buildings.

There were many ways in which the rules he had laid down might be applied, the choice of which would be guided by taste and circumstances. In this short paper he could but indicate certain useful arrangements—viz., let the engineer remember the simple axiom: "The purpose and object of artificial lighting are to make properly visible the things required to be seen." This really covered the whole case, but might be interpreted in the following rules: (1) The lamps or other sources of light should be so arranged that they are not visible from the more frequented or ordinary points of view. (2) The illumination should be sufficient to cause the objects to appeal at once to the eye, but should be free from glare. (3) For general illumination, the light should have a preponderating downward direction, freely flooding ceiling and walls, uniformly distributed and fully diffused. (4) Special work at desks, benches, etc., should have special lighting, adjustable in position and power, with opaque shades. (5) The color of the light should be as pure and white as possible- All monochromatic light should, as a rule, be avoided.

The stages of theaters were about the only places that were always well illuminated; the scenery and the lighting were each the complement of the other, with the most natural and agreeable results. Now, if architecture had any power to charm, that power could only take effect when it was subjected to suitable lighting. It was curious that this truism was so completely overlooked, as one might say in any public building, sacred or secular. The architects of Ancient Rome well knew that it was upon the lights and shadows that their superb art depended. With regard to the disputed question of direct *v.* indirect lighting, he advised them to always prefer direct lighting in so far as it would accord with the above rules; indirect lighting where specially suitable or inevitable; and for the rest, an arrangement of limited obscuration of lights which combined the advantages of the other two.

Street lighting was at present extremely unsatisfactory. There was no diffusion, no reflection, nothing but a blinding display of lights in a background of darkness, that, amid motor cars and the like, only served to bewilder the bravest. Why should not these intense lights be shaded, the exteriors of the buildings as well as the pavements illuminated, and, by the encouragement of diffused light, the citizen be able to see what manner of place he was in, and to walk or drive comfortably and safely through it? It would have to come by and by.

Items of Interest
FROM VARIOUS LOCALITIES.

THE following resolution was adopted at a meeting of the Board of Directors of the Cruse-Kemper Company:

"The Board of Directors accepts with regret the resignation of President Arthur R. Cruse, to take effect November 1st, 1910, and thanks him for his long and efficient service to the Company.

"The Board wishes him all success in his new undertakings."

MR. E. L. SMITH, of Paola, Kas., has been appointed Superintendent of the Olathe (Kas.) Gas Company. He is recognized throughout Kansas as a dependable authority on the natural gas fields of that State.

THE vertical benchwork in the new plant of the Providence (R. I.) Gas Company, at Sassafrass Point has been fired up, rather it is being fired up in easy stages. Those who have seen the plant declare that it is a splendid example of construction. For that matter one could not expect a different verdict, since it was designed and constructed under the supervision of that thorough engineer, Mr. F. J. Mayer.

THE showing made by the Baltimore Consolidated Gas, Electric Light and Power Company, for the 12 months ended June 30, submitted to the stockholders at their annual meeting some days ago, was by far the most satisfactory in its history. As compared with the prior fiscal year, the gross income shows an increase of $249,821.98, or 5.6 per cent., and the net earnings $263,875.57, or 12.1 per cent. Expenditures during the year for new construction were returned at $445,414.62, allotted as follows: Gas division, $267,250.21; electric division, $178,163.81. For ordinary repairs and maintenance there was expended and charged to operating expense during the year, $323,752.40, or 6.8 per cent. of the gross income. The total sales of gas show an increase of 4.70 per cent. for the year; 30¾ miles of street main, and 5,689 new gas services were added to the distribution system. This brought the total main mileage up to 625¾. The increase in individual consumers was 5,494, these constituting a total of 96,416—a gain of 6 per cent. The sale of gas appliances kept up in a satisfactory way, ranges to the number of 7,039 and water heaters to the number of 1,947 having been placed—the gain is respect of appliances figures out at 14 per cent. As a result of (and directly traceable thereto) economies effected in the manufacturing and other divisions of the Company, the ratio of operating expenses and taxes to the gross income of the gas division was reduced 1.56 per cent. The ratio of operating expenses and taxes to gross income was 5.63 per cent. less than in the preceding year. The total number of electric consumers at the end of the year was 14,995, an increase of 7,485, or 11 per cent. Though much of the new business acquired was connected during the latter part of the year, sales show a kilowatt increase of 16 per cent. over the year preceding. It is worthy of note here that during the incumbency as Manager of Mr. Warfield (he retired from the Company's service not long ago), covering a period of 6 years, the income (gross) from sales of gas and electricity increased from $3,570,515 to $4,679,500 a gain of $1,108,984, or 31 per cent. The number of electric consumers increased 6,077, or 68 per cent., and the gain in gas consumers' account was 18,673, or 24 per cent.

A DESPATCH to London, from Reykjavik, Iceland, under date of the 18th ult., is to this effect: "Iceland is a country of Suffragettes, and the Town Council of Reykjavik, the capital, is composed of equal numbers (in round figures) of men and women. Recently the question was under consideration whether the town should be lighted by gas or by electricity. The male members of the Council voted solidly for electricity and the women voted unanimously for gas, that they might utilize it for cooking. The vote was a tie, and the Mayor, a mere man, after a week's consideration, cast the ballot for the women, and gas it will be."

"S. T. T.," writing from Bloomington, Ills., under date of the 5th inst., incloses the following: "Mr. Albert Saudt, Manager of the Clinton (Ills.) Gas and Electric Company, has tendered his resignation. It was accepted, and his successor is Mr. Daniel Snyder, son of Mr. C. A. Snyder, the President of the Company. The new appointee assumed charge on the 1st inst."

AT the annual meeting of the shareholders in the Baltimore Consolidated Gas, Electric Light and Power Company, the following Directors were elected: Messrs. F. W. Wood, J. E. Aldred, Charles Adler, E. R. Wood, N. F. Brady, T. J. Shyrock, S. R. Bertron, F. C. Latrobe, S. D. Warfield, C. H. Dickey, Norman James, C. T. Crane, C. M, Cohn, F. A. Furst, Geo. Cator, F. H. Hambleton. C. G. Clarke and H. S. Holt. The members on the old Board who failed of re-election, were Messrs. A. N. Brady, Jno. B. Dennis, W. H. Cassel and Wm. Casey. Mr. Latrobe was subsequently elected President, and Mr. Aldred was chosen Chairman of the Board.

"THE proprietors of 'The Bowen Grocery Store,' which is a feature of the business district of Allentown, Pa., have installed a gas plant of the producer type, which is contained in a cement structure to the rear of their warerooms on Hamilton street." So writes a correspondent under date of the 4th inst. It is up to producing about 175,000 cubic feet of producer gas, containing 210 B.T.U.'s, and the

product is to be used in actuating a 35-horse power gasoline engine, and to operate a dynamo that generates current for the lighting of the establishment, and to furnish fuel for all necessary purposes about the shop—this includes fuel for the Bowen bakery, one division of which turns out quite a weight per day of coarse candies. I hope that you will not hear from me in connection with the statement that the producer outfit has gone to pieces via the explosive way; but it may save searching quite a bit some later day if it is jotted down in your ready-to-hand diary that the Bowen producer system began actual work in October, 1910.—B. R. S."

"DEAR JOURNAL: The first regular meeting of the proprietors of the Decorah Gas Company was held in Vinton, Ia., to-day—the 29th ult., and Messrs. E. Parman and L. B. Whitney, of Decorah, and Messrs. John Lorenz, W. W. Sanders and G. K. Gilchrist, of Vinton, were elected Directors. Mr. W. W. Sanders was appointed local Manager. The articles of incorporation which drawn up under the direction of Mr. E. J. Parman, have been filed. The Company was incorporated with a capital of $40,000. Manager Sanders declares that the plant will be ready to supply gas by the first of the year.—VAN."

"ROUND poles versus square poles" is the question at issue between the authorities of Laconia, N. H., and the Laconia Gas and Electric Company, writes a correspondent in Manchester, N. H. Continuing he further writes: "This matter was before the Laconia City Council the evening of the 3d inst., when, by a vote of 5 to 3, it was resolved to rescind the action taken at a prior meeting, when the Laconia Gas and Electric Company was granted the privilege of using round poles instead of square ones for its new power station at East Tilton to the power station at Lakeport. No particular reason is given for the change of base, although it was suggested that certain residents thought round, rough poles would not correspond well with the esthetic thought of Laconia's 'best citizens.'—V. P. S."

THE Lansdale (Pa.) *Republican* is our authority for the statement that the proprietors of the Montgomery (Pa.) Heat and Fuel Company have purchased the right to manufacture gas in Montgomery and Bucks counties, under the patent of the Hydrogen-Petrol Company system—whatever that may be.

THE franchise granted to C. E. Gregory and associates for the right to construct and operate a gas works in Freeport, Ills., which would have expired by limitation the 9th inst., has been extended to the 10th prox.

THE Centralia (Ills) Gas Company is now comfortably located in its handsomely fitted up business headquarters, which are on the northeast, ground corner of the Pittenger Building, Centralia.

MESSRS. H. M. BYLLESBY & Co., have issued a neatly gotten up circular-pamphlet for distribution amongst and for consideration by its employees, detailing how the employees should comport or hold themselves in respect of the public. The keynote to the instructions is found in the following sentences, which sentences are the ones introductory to the general text:

"As members of the Byllesby organization you are public servants in the true meaning of the term.

"It is particularly important that every officer, every head of department and every employee of whatever capacity, should realize this fact and regulate his conduct accordingly."

"A. E. W.," writing from Washington, Ind., under date of the 7th inst., incloses the following: "According to the decision of Judge H. Q. Houghton, in the case of Bascom Parker against The City Gas Company, of Washington, Ind., Mr. Parker is indebted to the Gas Company in the sum of $21,280.75. It was found that Mr. Parker was chargeable with $58,733.90, and as he is given credit for $37,473.15, a balance of something over $21,000 is owed to the Gas Company. Receiver C. P. Boyle was ordered to recover that amount from Bascom Parker, with interest at 6 per cent."

THE proprietors of the New Bedford (Mass.) Gas and Edison Light Company have ordered another reduction in the selling rate, the same to be effective after the 1st prox. The superseding schedule puts the gross price at 90 cents per 1,000 cubic feet, and prompt payment (within 10 days) brings into play a discount of 5 cents per 1,000. This is a concession from the ruling rate of 5 cents per 1,000.

MR. P. H. GADSDEN, President of the Charleston (S. C.) Railway and Lighting Company, recently issued the following statement

"Commencing January 1, 1911, the gas rate for all purposes will be $1.20 per 1,000 cubic feet net. It will be remembered that some 4 years ago the Company entered into a contract with City Council by which the price of illuminating gas, which was then $1.60, was immediately reduced to $1.45. The agreement further provided for an annual reduction of 5 cents per 1,000 feet until the rate of illuminating gas reached $1.25. Under this agreement the price of illuminating gas has been regularly reduced by the Company, the rate this year being $1.30. On the 1st of March, 1911, the rate would, in accordance with our contract with City Council, be reduced to $1.25. The fact that the Company is constructing an up-to-date gas plant, which will, we hope, be completed by the 1st of January, will enable us to manufacture gas more economically than at the old plant, and it is the policy of the Company in such case to share such savings with the public. We have, therefore, determined, as I have stated above, to make the rate on the 1st of January $1.20 net for both illuminating and fuel. This will mean that it will be possible for the consumers of the Company to use gas heaters in any part of the house, without going to the expense of having additional pipes put in. It will also mean that cooking stoves, instantaneous heaters and other gas appliances can be connected in any part of the house where they are desired. We believe that this will stimulate very greatly the use of gas heaters by the people of Charleston, as we are satisfied that this is an ideal climate for this method of heating, and we confidently expect a very considerable increase in our business from this source."

IT may be taken for granted Long Island, even as to its eastern termination, is waking up, when one learns that the Sag Harbor Gas Company this season extended its main system about ½ mile. A century ago Sag Harbor was noted in the marts that purveyed unto the artificial lighting needs of the States; for great was the rivalry that existed between New Bedford, Mass., and the quaint old Long Island village as to which would send out the greatest number of whaling vessels each year, and as to who of the returning crews would have secured the largest quantities of whale oil and whalebone.

CITY ENGINEER COOPER, of Yonkers, N. Y., says it is only a matter of detail now as to the extension of its mains through the settlements of Crestwood and Armour Villa Park, by the Westchester Lighting Company.

RESPECTING the exterior illumination of the new office building of the Denver (Col.) Gas and Electric Company, which was to have practically been made the first Saturday in this month, the Denver *Post* had this to say: The candle power alone will be 200,000 greater than carried by any other building in the world, regardless of size. This power will send out current into 12,000 lamps through 2,000 miles of wire, of which 1,800 are in motor generators. The cost of illumination alone exceeds $50,000 annually. New Yorkers who imagine that the illumination on the Singer building and Metropolitan tower rivals the seven wonders of the world will hereafter look upon the New York monuments of lighting as mere specks of illumination in comparison with the square of solid luminosity that will place Denver on the highest pinnacle among cities of the world in the matter of lighting. There will be enough light on the outside of the building alone to light a city of 400,000 inhabitants. The light will flow in floods from every side of the building, and far off on the middle range of the Rockies the lonely rancher will wonder, like the shepherds of old, at the wonderful reflection against the sky. One illuminating engineer said to-day that if the lighting of the building could be concentrated in a beam of light an inch in diameter it would reach half way to the moon, or a distance of over 115,000 miles. From the main feeder of the building, where the currrent comes in from the station, there proceed thousands of arteries of wire, which, if stretched in a straight line and hung with lamps, could light a trans-continental thoroughfare. If the power required to light the building for 3 hours a night were used in curling irons it would be sufficient to take care of the toilets of 10,000 women for 6 months. If the power were required to push around the tramway cars it would keep them going every day and night for a week, and were every home in Denver equipped with an electric stove the power would cook the evening meal in the 45,000 households of which Denver boasts. To be exact, the electric power of the building may be summed up in the following manner: Spread around the exterior of the building at regular intervals are 15,480 4-candle power lamps, 620 20-candle power lamps, 252 30-candle power lamps, 578 48-candle power lamps, and 100 200-candle power lamps. These units will give a total of 129,240-candle power, and which will, when it bursts forth in brilliancy, indicate and emphasize the fact that Denver does let her light shine forth that men may see her good works.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

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ELBERT P. CALLENDER,
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MONDAY, OCTOBER 17, 1910.

The Market for Gas Securities.

The movement in Consolidated gas continues, although the trading is not particularly large. It came in this morning (Friday) at 136 to 136¼, and the inquiry was all on the purchasing side. There can be no doubt that within the past 3 months several large blocks of Consolidated have been put away in boxes that will not be disturbed much until the refinancing of the Consolidated properties is well underway.

Brooklyn Union is steady, and, like Consolidated, all inquiries respecting it spring from would-be investors. The disquietude respecting Peoples, of Chicago, anent the tentative revision of gas rates there, keeps those shares at a riduculously low figure. A feature of the annual report of the Massachusetts Gas Companies is that surplus to profit account for the 12 months shows a gain of close to $160,000 in cash.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

OCTOBER 17.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$73,177,000	100	136	136¼
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	8,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	137	138
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106½	107
Yonkers	299,650	500	180	—
Out-of-Town Companies.				
Bay State	50,000,000	50	5/8	¾
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	309,000	1,000	90	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	105½
Cincinnati Gas and Electric Co.	29,500,000	100	92	98
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	106½	—
Mortgages, 6's	3,600,000	—	89	100
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	980,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	3,500,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	881,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	390,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	102½	103¾
Preferred	2,500,006	100	91	102
Bonds	10,000,000	1,000	102¾	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	106¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	84½	86
Preferred	25,000,000	100	93	93½
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	109¼	109½
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	1,600,000	200	382½	385
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	361	—

Advertisers' Index.

New advertising, or changes in standing ads., to assure attention the issue following their reception, must be in hand on Wednesday.

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Western Gas Construction Co., Fort Wayne, Ind. 720

BURNERS.
Wm. M. Crane Co., New York City 752

CEMENTS AND CONCRETES.
C. L. Gerould, New Castle, Pa. 756
Ernst Strassburger, Chicago, Ills. 758
Laclede-Christy Clay Products Co., St. Louis, Mo. 746

CHARGING BARROWS & COAL WAGONS.
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
The Stacey Mfg. Co., Cincinnati, O. 763

COKE CRUSHERS.
Bartlett-Hayward Co., Baltimore, Md. 761
C. M. Keller, Columbus, Ind. 759

CONVEYORS—ALL KINDS.
Bartlett-Hayward Co., Baltimore, Md. 761
Brown Hoisting Machinery Co., Cleveland, O. 763
Cruse-Kemper Co., Ambler, Pa. 748
C. W. Hunt Company, New York City 746
Fred Bredel Co., Milwaukee, Wis. 763
G. A. Bronder, New York City 757
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
Western Gas Construction Co., Fort Wayne, Ind. 720

EXHAUSTERS.
Connelly Iron Sponge & Governor Co., New York City 757
Connersville Blower Company, Connersville, Ind. 764
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Isbell-Porter Company, Newark, N. J. 757
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
Piqua Blower Co., Piqua, O. 749
The P. H. & F. M. Roots Co., Connersville, Ind. 751

GAS AND WATER PIPES.
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Donaldson Iron Co., Emaus, Pa 752
R. D. Wood & Co., Philadelphia, Pa. 766

GAS BLAST FURNACES.
American Gas Furnace Co., New York City 744

GAS COALS.
Berwind-White Coal Mining Co., New York and Phila. 758
Westmoreland Gas Coal Co., Philadelphia, Pa. 759

GAS COCKS.
H. Mueller Manufacturing Co., Decatur, Ills. 753

GAS ENGINEERS.
Bartlett-Hayward Co., Baltimore, Md. 761
Cruse-Kemper Co., Ambler, Pa. 748
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Drakes Limited, Halifax, England. 750
Edwin E. Witherby, New York City. 737
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Frank D. Moses, Trenton, N. J. 652
Fred Bredel Co., Milwaukee, Wis. 763
Frederick J. Mayer, New York City 756
Glenn Marston, New York City 737
Henry I. Lea, Chicago, Ills. 760
H. M. Byllesby & Co., Chicago, Ills. 760
H. Thurston Owens, New York City 737
Humphreys & Glasgow, New York City. 760
Improved Equipment Company, New York City 751
Isbell-Porter Co., Newark, N. J. 747
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
Laclede-Christy Clay Products Co., St. Louis, Mo. 746
Light, Heat and Power Corporation, Boston, Mass. 738
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 750
Quintard Iron Works, New York City 749
R. D. Wood & Co., Philadelphia, Pa. 766
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
The United Gas Improvement Co., Philadelphia, Pa. 755
Western Gas Construction Co., Fort Wayne, Ind. 720
William A. Baehr, Chicago, Ills. 738
William W. Randolph, New York City 753

GAS ENRICHERS.
Standard Oil Co., New York City 711

GAS GAUGES.
The Bristol Co., Waterbury, Conn. 752

GAS GOVERNORS.
Chaplin-Fulton Mfg. Co., Pittsburg, Pa. 757
Connelly Iron Sponge & Governor Co., New York City 757
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Isbell-Porter Co., Newark, N. J. 747
Pittsburg Meter Co., East Pittsburg, Pa. 750
Reynolds Gas Regulator Co., Anderson, Ind. 767

GASHOLDERS.

Bartlett-Hayward Co., Baltimore, Md. 761
Chicago Bridge and Iron Works, Chicago, Ills. 742
Cruse-Kemper Co., Ambler, Pa. 748
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Deily & Fowler Mfg. Co., Philadelphia, Pa. 764
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
R. D. Wood & Co., Philadelphia, Pa. 756
Riter-Conley Mfg. Co., Pittsburgh, Pa. 739
The Stacey Mfg. Co., Cincinnati, O. 753
Western Gas Construction Co., Fort Wayne, Ind. 720

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., New York City. 759

GAS METER CONNECTIONS.

H. Mueller Manufacturing Co., Decatur, Ills. 753

GAS METERS.

American Meter Co., New York and Philadelphia. 767
D. McDonald & Co., Albany, N. Y. 765
Helme & McIlhenny, Philadelphia, Pa. 767
John J. Griffin & Co., Philadelphia, Pa. 768
Keystone Meter Co., Royersford, Pa. 766
Maryland Meter and Mfg. Co., Baltimore, Md. 766
Metric Metal Co., Erie, Pa. 767
Nathaniel Tufts Meter Co., Boston, Mass. 766
New York Improved Meter Co., New York City. 750
Pittsburg Meter Co., East Pittsburg, Pa. 750
Rotary Meter Co., New York City. 765
Sprague Meter Co., Bridgeport, Conn. 765

GAS PLANT TOOLS.

H. Mueller Manufacturing Co., Decatur, Ills. 753

GAS STOVES.

American Meter Co., New York and Philadelphia. 767
Keystone Meter Co., Royersford, Pa. 766
Maryland Meter & Manufacturing Co., Baltimore, Md. 766
Nathaniel Tufts Meter Co., Boston, Mass. 766

GAS TAPPING MACHINES.

George Light, Dayton, O. 759
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GAS WORKS APPARATUS AND CONSTRUCTION.

Bartlett-Hayward Co., Baltimore, Md. 761
Connelly Iron Sponge & Governor New Co., York City. 757
Cruse-Kemper Co., Ambler, Pa. 748
Davis & Farnum Mfg. Co., Waltham, Mass. 760
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Evens & Howard Firebrick Co., St. Louis, Mo. 743
Fred Bredel Co., Milwaukee, Wis. 763
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Humphreys & Glasgow, New York City. 760
Improved Equipment Company, New York City. 741
Isbell-Porter Co., New York City. 747
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Laclede-Christy Clay Products Co., St. Louis, Mo. 746
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Quintard Iron Works Co., New York City. 749
R. D. Wood & Co., Philadelphia, Pa. 766
Riter-Conley Mfg. Co., Pittsburgh, Pa. 739
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
The United Gas Improvement Co., Philadelphia, Pa. 755
Western Gas Construction Co., Fort Wayne, Ind. 720

HIGH PRESSURE GAS GOODS.

H. Mueller Manufacturing Co., Decatur, Ills. 753

HOT WATER HEATERS.

Humphrey Co., Kalamazoo, Mich. 744

INCANDESCENT GAS LAMPS.

American Gas Light Co., Kalamazoo, Mich. 740
General Gas Light Co., Kalamazoo, Mich. 745
Welsbach Company, Gloucester, N. J. 751

INCLINED RETORTS.

Baltimore Retort and Firebrick Co., Baltimore, Md. 756
Didier-March Co., New York City. 763
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Fred Bredel Co., Milwaukee, Wis. 763
Gas Bench Construction Co., St. Louis, Mo. 749
Improved Equipment Company, New York City. 741
Laclede-Christy Clay Products Co., St. Louis, Mo. 746
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 756

MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y. 759

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PIPE LINE TOOLS.

H. Mueller Manufacturing Co., Decatur, Ills. 753

PREPAYMENT METER ATTACHMENTS.

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American Meter Co., New York and Philadelphia. 767
D. McDonald & Co., Albany, N. Y. 765
Helme & McIlhenny, Philadelphia, Pa. 767
John J. Griffin & Co., Philadelphia, Pa. 768
Keystone Meter Co., Royersford, Pa. 766
Nathaniel Tufts Meter Co., Boston, Mass. 766
New York Improved Meter Co. New York City. 766
Pittsburg Meter Co., East Pittsburg, Pa. 750
Sprague Meter Co., Bridgeport, Conn. 765

PROCESSES.

Bartlett-Hayward Co., Baltimore, Md. 761
Fred Bredel Co., Milwaukee, Wis. 763
Humphreys & Glasgow, New York City. 760
Improved Equipment Company, New York City. 741
The Gas Machinery Co., Cleveland, O. 695
The United Gas Improvement Co., Philadelphia, Pa. 755
Western Gas Construction Co., Fort Wayne, Ind. 720

PRODUCER POWER PLANTS.

R. D. Wood & Co., Philadelphia, Pa. 766

PURIFIER AND SCRUBBER TRAYS.

Bartlett-Hayward Co., Baltimore, Md. 761
Cabot Mfg. Co., Hoboken, N. J. 759
Western Gas Construction Co., Fort Wayne, Ind. 720

PURIFIERS.

Bartlett-Hayward & Co., Baltimore, Md. 761
Connelly Iron Sponge & Governor Co., New York City. 757
Cruse-Kemper Co., Ambler, Pa. 748
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Isbell-Porter Co., Newark, N. J. 747
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
Quintard Iron Works, New York City. 749
R. D. Wood & Co., Philadelphia, Pa. 766
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
The United Gas Improvement Co., Philadelphia, Pa. 755
Western Gas Construction Co., Fort Wayne, Ind. 720

PURIFYING MATERIALS.

Connelly Iron Sponge & Governor Co., New York City 757
The United Gas Improvement Co., Philadelphia, Pa. 755

REGENERATIVE FURNACES.

Baltimore Retort and Firebrick Co., Baltimore, Md. 756
Bartlett, Hayward & Co., Baltimore, Md. 761
Didier-March Co., New York City. 762
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Fred Bredel Co., Milwaukee, Wis. 763
Gas Bench Construction Co., St. Louis, Mo. 749
Improved Equipment Company, New York City. 741
J. H. Gautier & Co., Jersey City, N. J. 756
Laclede-Christy Clay Products Co., St. Louis, Mo. 746
Missouri Firebrick Co., St. Louis, Mo. 756
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 756

RETORTS AND FIREBRICKS.

Baltimore Retort and Firebrick Co., Baltimore, Md. 756
Didier-March Co., New York City. 762
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Fred Bredel Co., Milwaukee, Wis. 763
Gas Bench Construction Co., St. Louis, Mo. 749
Henry Maurer & Son, New York City. 749
Improved Equipment Company, New York City. 741
James Gardner, Jr., Co., Bolivar, Pa. 754
J. H. Gautier & Co., Jersey City, N. J. 756
Laclede-Christy Clay Products Co., St. Louis, Mo. 746
Missouri Firebrick Co., St. Louis, Mo. 756
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 756

RUBBER GOODS.

New York Rubber Co., New York City. 744

SCRUBBERS AND CONDENSERS.

Bartlett-Hayward Co., Baltimore, Md. 761
Cruse-Kemper Co., Amler, Pa. 748
Davis & Farnum Mfg. Co., Waltham, Mass. 750
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Fred Bredel Co., Milwaukee, Wis. 763
Isbell-Porter Co., Newark, N. J. 747
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
Quintard Iron Works, New York City. 749
R. D. Wood & Co., Philadelphia, Pa. 766
Riter-Conley Mfg. Co., Pittsburgh, Pa. 739
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
The United Gas Improvement Co., Philadelphia, Pa. 755
Western Gas Construction Co., Fort Wayne, Ind. 720

SELF-SEALING MOUTHPIECE DOORS.

Bartlett-Hayward Co., Baltimore, Md. 761
Davis & Farnum Mfg. Co., Waltham, Mass. 750
Fred Bredel Co., Milwaukee, Wis. 763
Isbell-Porter Co., Newark, N. J. 747
Improved Equipment Company, New York City. 741
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 756
Quintard Iron Works, New York City. 749
R. D. Wood & Co., Philadelphia, Pa. 766
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
Western Gas Construction Co., Fort Wayne, Ind. 720

STOKING MACHINERY.

Fred Bredel Co., Milwaukee, Wis. 764
G. A. Bronder, New York City. 757
Laclede-Christy Clay Products Co., St. Louis, Mo. 746
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 756

STORAGE TANKS.

Bartlett-Hayward Co., Baltimore, Md. 761
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Quintard Iron Works, New York City. 749
The Stacey Mfg. Co., Cincinnati, O. 763
Western Gas Construction Co., Fort Wayne, Ind. 720

STREET LAMPS.

Thos. T. W. Miner, New York City. 746
Welsbach Street Lighting Co., New York and Phila. 754

TAR AND CARBONIC ACID EXTRACTOR.

Bartlett-Hayward Co., Baltimore, Md. 761
Fred Bredel Co., Milwaukee, Wis. 763
Isbell-Porter Co., Newark, N. J. 747
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
The Gas Machinery Co., Cleveland, O. 695
The Stacey Mfg. Co., Cincinnati, O. 763
The United Gas Improvement Co., Philadelphia, Pa. 755
Western Gas Construction Co., Fort Wayne, Ind. 720

VALVES.

Bartlett-Hayward & Co., Baltimore, Md. 761
Davis & Farnum Mfg. Co., Waltham, Mass. 760
Isbell-Porter Co., Newark, N. J. 747
Kerr Murray Mfg. Co., Fort Wayne, Ind. 758
Ludlow Valve Manufacturing Co., Troy, N. Y. 758
R. D. Wood & Co., Philadelphia, Pa. 766
The Gas Machinery Co., Cleveland, O. 695
The P. H. & F. M. Roots Co., Connersville, Ind. 751
The Stacey Mfg. Co., Cincinnati, O. 763
Western Gas Construction Co., Fort Wayne, Ind. 720

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Improved Equipment Company, New York City. 741
Laclede-Christy Clay Products Co., St. Louis, Mo. 746
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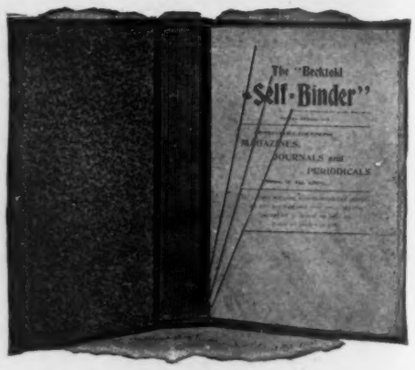

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MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, Oct. 19-21, 1910. New York City. Officers: President, Wm. H. Bradley, N. Y., City Secretary, A. B. Beadle, 29 West 39th street, N. Y. City.

Canadian Gas Association.—Annual meeting, June, 1911. ————. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, Nov., 1910. New York City. Officers: President, C. R. Huntley, Buffalo, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Guild of Gas Managers of New England.—Annual meeting, December. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, A. K. Quinn; Newport, R. I.; Secretary, Walter G. Africa, Manchester, N. H.

Illinois Gas Association.—Annual meeting, time, March, Chicago, Ills. Officers: President, A. S. Harrington, Chicago, Ill.; Secretary-Treasurer, C. B. Strohn, Elgin, Ill.

Illuminating Engineering Society.—Annual meeting, Baltimore, Md., Oct. 24, 25, 1911. Meetings of Sections, monthly. President, W. H. Gartley, Phila ,Pa.; Secretary, Preston S Millar, 29 W. 39th street, N. Y. City. Sections: New York: Secretary, Albert J. Marshall, 227 Fulton street. New England, Secretary, L. D. Gibbs 39 Boylston street, Boston, Mass. Philadelphia, Secretary, F. N. Morton, Broad and Arch streets Chicago, Secretary, T. R. Beebe, 157 Michigan avenue,

Indiana Gas Association.—Annual meeting, January 19, 1911, Fort Wayne, Ind. Officers: President, Carl H. Graf, Indianapolis; Vice-President, S. E. Mulholland; Secretary-Treasurer, Philmer Eves, Indianapolis Gas Company, Indianapolis, Ind.

Iowa District Gas Association.—Annual meeting, time, June, 1911, ————. Officers: President, Austin Burt, Waterloo, Ia.; Secretary and Treasurer, G. I Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, ———— Wichita, Kas. Officers: President, W. A. Scothorn, Hutchinson, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association—Annual meeting, time, Sept. 1911; Battle Creek. Officers: President, A. P. Ewing, Detroit, Mich.; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April 13, 14 and 15, 1911; St. Louis, Mo. Officers: President, R. J. Irvine; Secretary and Treasurer, W. J. Cunningham, Springfield, Mo.

National Commercial Gas Association.—Annual meeting, December 5-13, 1910 Boston. Officers: President, E. N. Wrightington, Boston; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May 16, 17 and 18, 1911; Pittsburgh, Pa. Officers: President, John M. Garard, Columbus, O, Secretary, T. C. Jones, Delaware, O. Editor Wrinkle Department, F. W. Stone, Ashtabula, O.

New England Gas Association.—Annual meeting, third Wednesday in February; Boston. Officers: President, W. H. Snow, Holyoke, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

Oklahoma Public Utilities Association.—Annual meeting, May 9, 10 and 11, 1911. Officers: President, E. C. Reynolds; Secretary, Galen Crow, Guthrie, Okla.

Pacific Coast Gas Association.—Annual meeting, Sept. 20, 21 and 22, 1911, Oakland, Cal. Officers: President, W. B. Cline, Los Angeles, Cal.; Secretary-Treasurer, John A. Britton, 225 Franklin street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, April, 1911, Reading, Pa. Officers President, J. H. Keppelman, Reading, Pa.; Secretary-Treasurer, William H. Merrill Lebanon, Pa.

Society of Gas Lighting.—Annual meeting, December, 1910; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 1123 Broadway, New York.

Southern Gas Association.—Annual meeting, April 19-21, 1911, Montgomery, Ala Officers President, H. W. Frund, Salisbury, N. C.; Secretary-Treasurer, Jas. Ferrier, Rome, Ga.

Southwestern Electrical and Gas Association.—Annual meeting, May, 1911, ———— Tex. Officers: President, W. B. Tuttle, San Antonio, Tex.; Secretary, H. B. Head, Stephensville, Tex.

Wisconsin Gas Association.—Annual meeting, May ——, 1911, Milwaukee, Wis Officers: President, W. H. Winslow, Superior, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.

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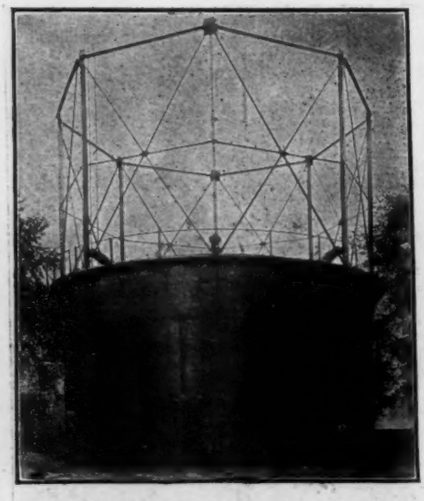

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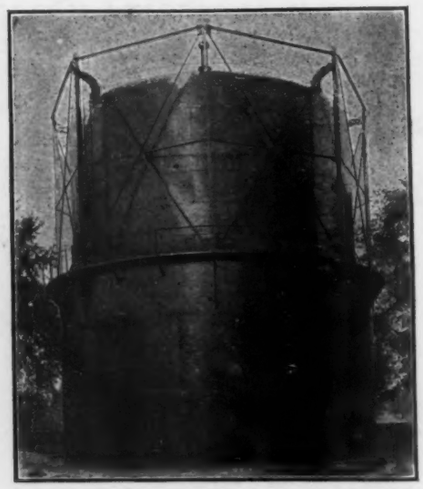

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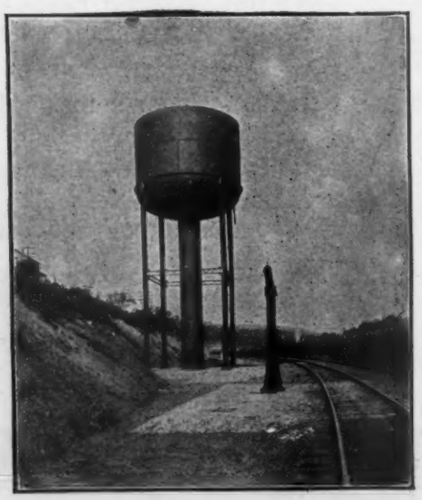

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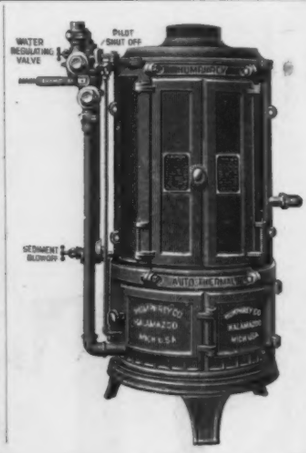

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SIZE - -
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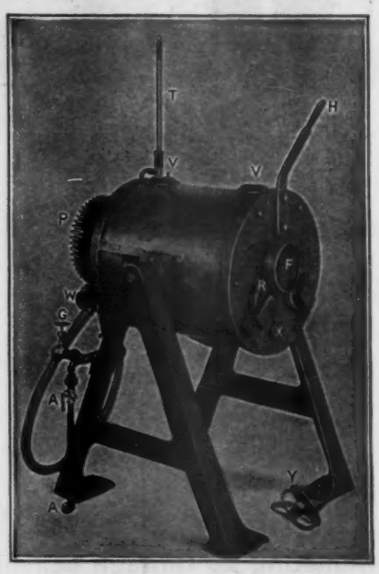

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ABERDEEN, WASH.
ALBION, MICH.
ANNISTON, ALA.
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BARABOO, WIS.
CHARLESTOWN, MASS.
CHEHALIS, WASH.
COLORADO SPRINGS, COL.
CRESTON, IA.
DALTON, GA.
DAYTON, O.
DECATUR, ALA.
DELRAY, MICH.
DETROIT, MICH.
GUADALAJARA, MEXICO.
HENDERSON, KY.
HUNTSVILLE, ALA.
IONIA, MICH.
IOWA CITY, IA.
LA CROSSE, WIS.
LOCKPORT, N. Y.
MARINETTE, WIS.
MARSHALLTOWN, IA.
MENOMINEE, MICH.
MILWAUKEE, WIS.
MT. PLEASANT, MICH.
NORFOLK, VA.
OWOSSO, MICH.
PARIS, KY.
PARIS, TEX.
PEKIN, ILLS.
PHILADELPHIA, PA.
RICH HILL, MO.
RICHMOND, IND.
ROCKFORD, ILLS.
SALT LAKE CITY, UTAH.
SOUTH HAVEN, MICH.
SPRINGFIELD, ILLS.
STURGIS, MICH.
TACOMA, WASH.
TALLADEGA, ALA.
TRINIDAD, COL.
TUSCALOOSA, ALA.
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FOR HANDLING COAL AND COKE IN GAS WORKS.

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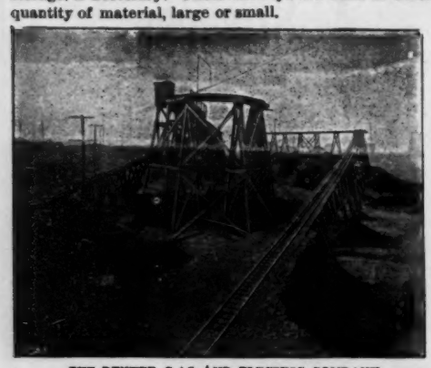

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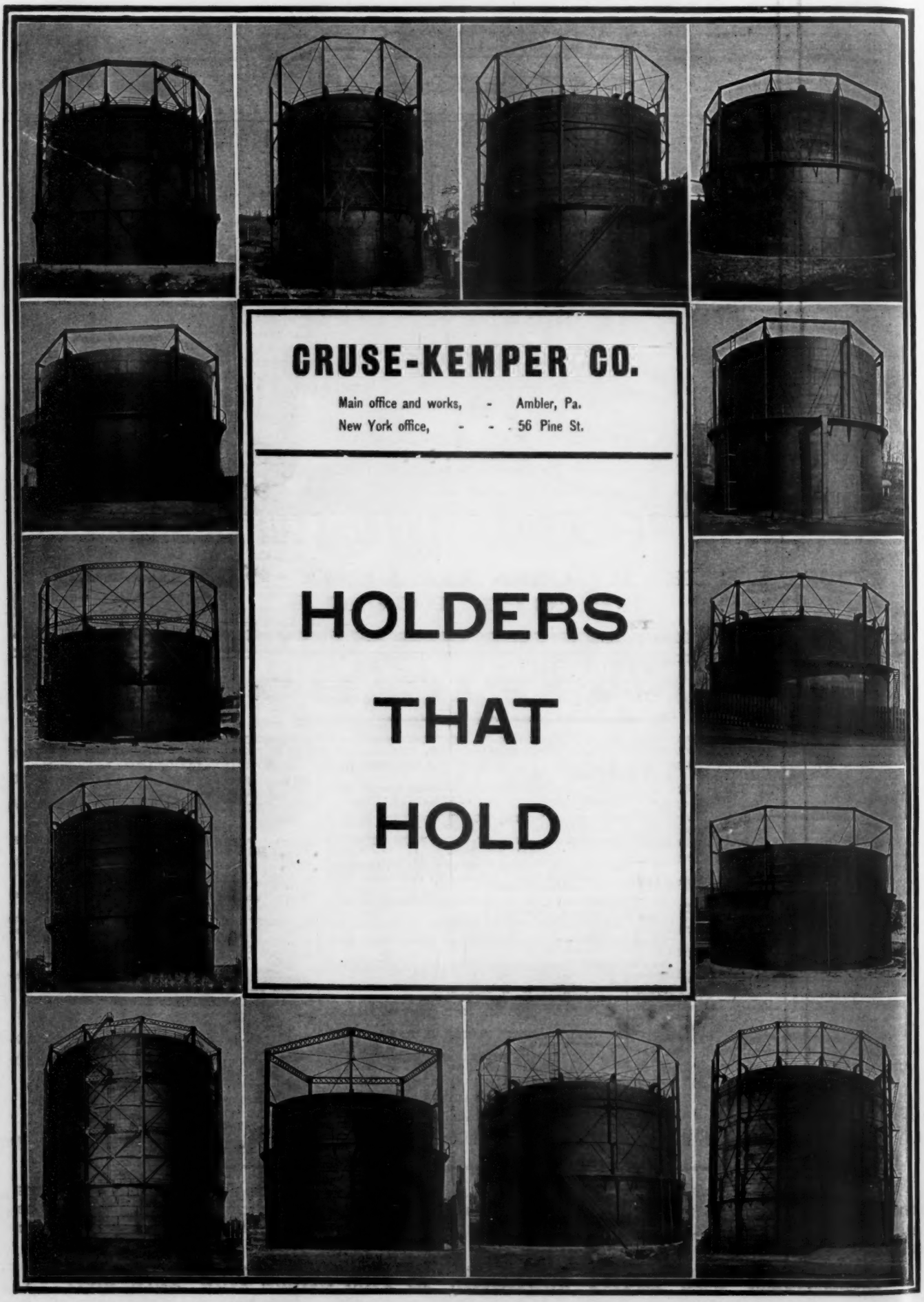
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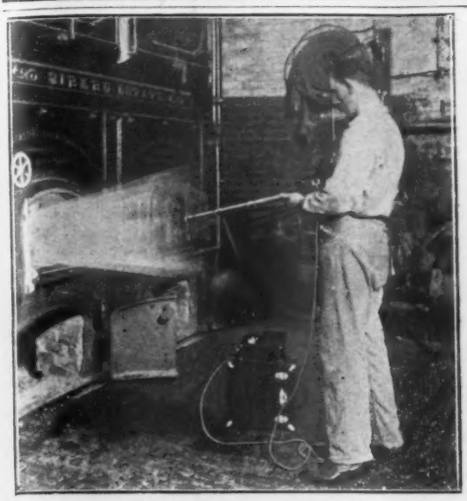

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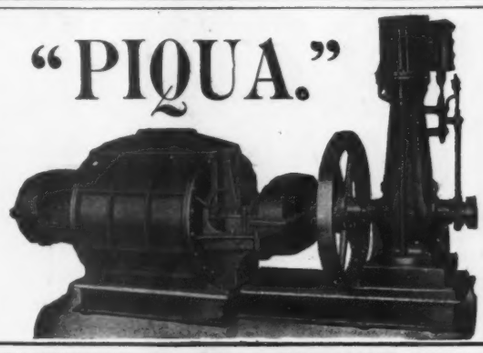

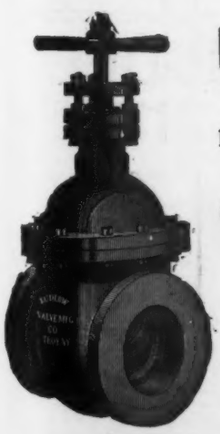

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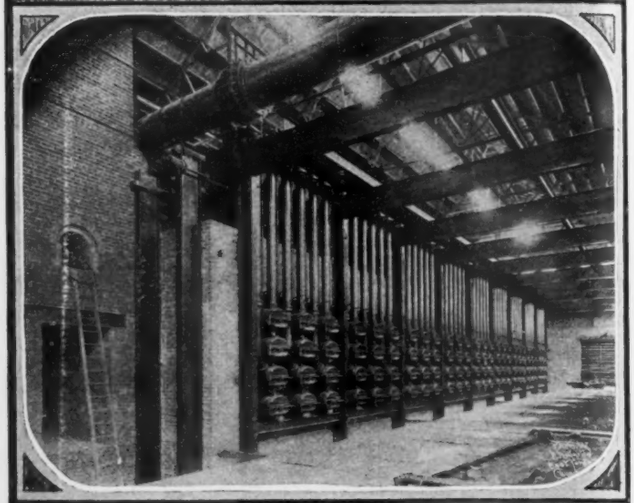

GAS ENGINEERS AND CONTRACTORS.

PUBLIC LIGHTING TABLES FOR OCTOBER, 1910.

[COMMUNICATED BY THE AMERICAN METER COMPANY.]

Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.	Day of Week.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Date.	Complete Lighting in 1 Hour. From Time Given.	Complete Extinguishing in 50 Minutes. From Time Given.
		P.M.				P.M.	A.M.
Sat.	1	6.20	4.50 A.M.	Sat.	1	5.22	4.42
Sun.	2	6.10 N.M.	5.00	Sun.	2	5.22	4.42
Mon.	3	6.10	5.00	Mon.	3	5.22	4.42
Tue.	4	6.10	5.00	Tue.	4	5.22	4.42
Wed.	5	6.10	5.00	Wed.	5	5.22	4.42
Thu.	6	6.10	5.00	Thu.	6	5.22	4.42
Fri.	7	6.50	5.00	Fri.	7	5.22	4.42
Sat.	8	7.20	5.00	Sat.	8	5.12	4.52
Sun.	9	8.10	5.10	Sun.	9	5.12	4.52
Mon.	10	9.00	5.10	Mon.	10	5.12	4.52
Tue.	11	9.50 F.Q.	5.10	Tue.	11	5.12	4.52
Wed.	12	11.00 A.M.	5.10	Wed.	12	5.12	4.52
Thu.	13	12.10	5.10	Thu.	13	5.07	4.52
Fri.	14	1.20	5.10	Fri.	14	5.07	4.52
Sat.	15	2.30	5.10	Sat.	15	4.57	5.02
Sun.	16	3.50	5.10	Sun.	16	4.57	5.02
Mon.	17	No L.	No L.	Mon.	17	4.57	5.02
Tue.	18	No L. F.M.	No L.	Tue.	18	4.57	5.02
Wed.	19	No L.	No L.	Wed.	19	4.57	5.02
Thu.	20	5.40 P.M.	7.40 P.M.	Thu.	20	4.57	5.02
Fri.	21	5.40	8.30	Fri.	21	4.57	5.02
Sat.	22	5.40	9.20	Sat.	22	4.47	5.07
Sun.	23	5.40	10.20	Sun.	23	4.47	5.07
Mon.	24	5.40 L.Q.	11.30	Mon.	24	4.47	5.07
Tue.	25	5.40	12.40 A.M.	Tue.	25	4.47	5.07
Wed.	26	5.40	1.40	Wed.	26	4.47	5.07
Thu.	27	5.40	2.50	hu.T	27	4.47	5.07
Fri.	28	5.40	3.50	Fri.	28	4.47	5.07
Sat.	29	5.40	5.30	Sat.	29	4.37	5.17
Sun.	30	5.30	5.30	Sun.	30	4.37	5.17
Mon.	31	5.30	5.30	Mon.	31	4.37	5.17

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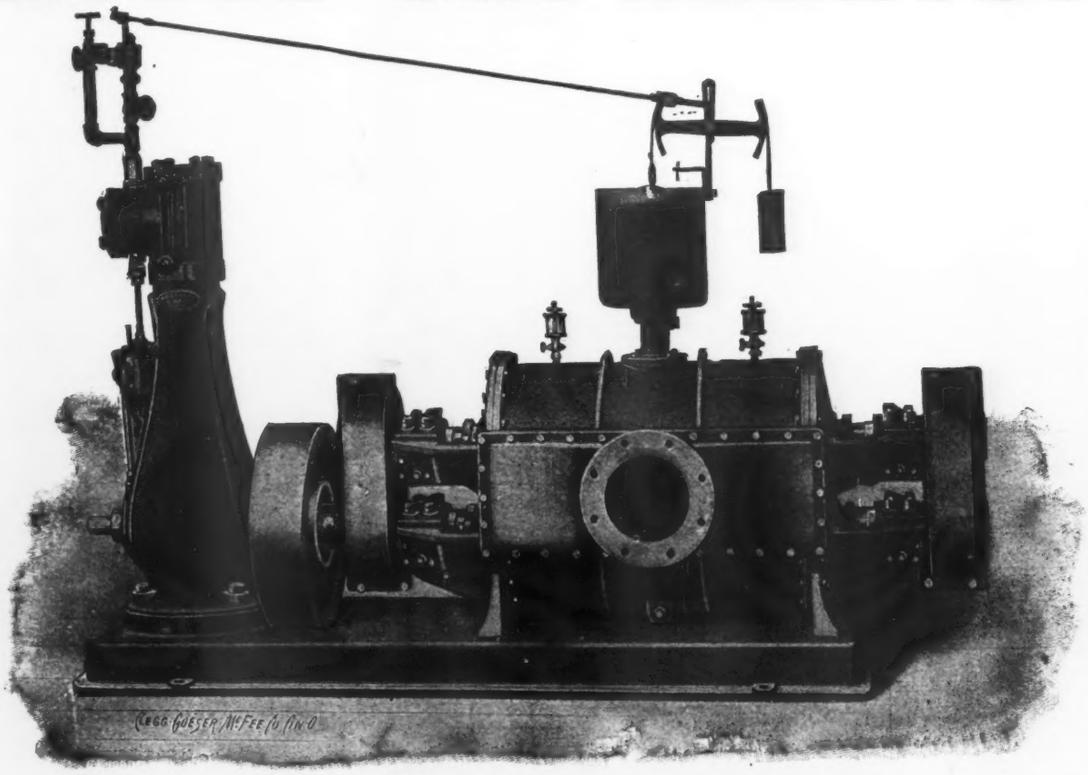

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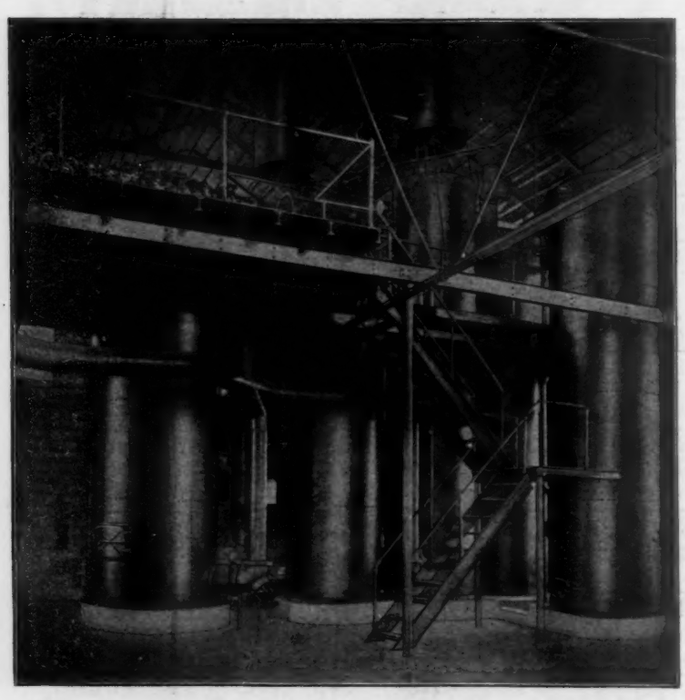

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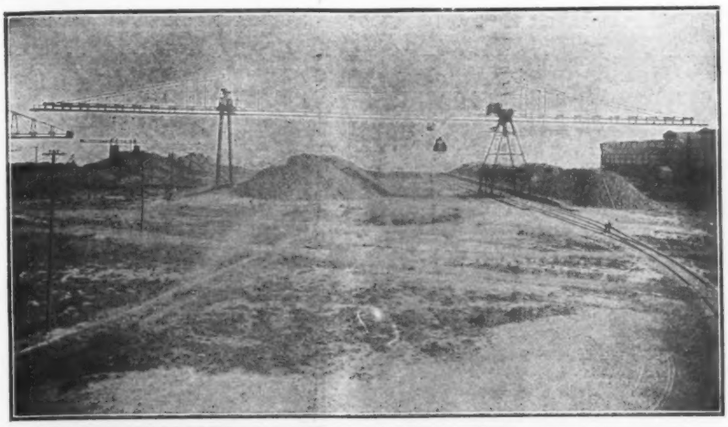

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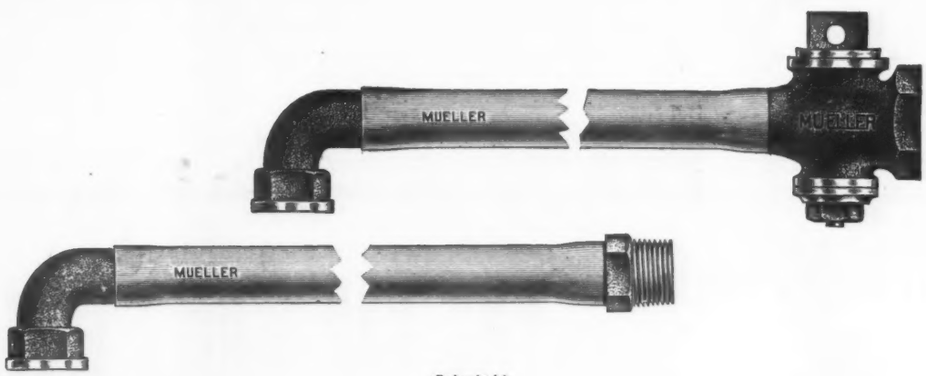

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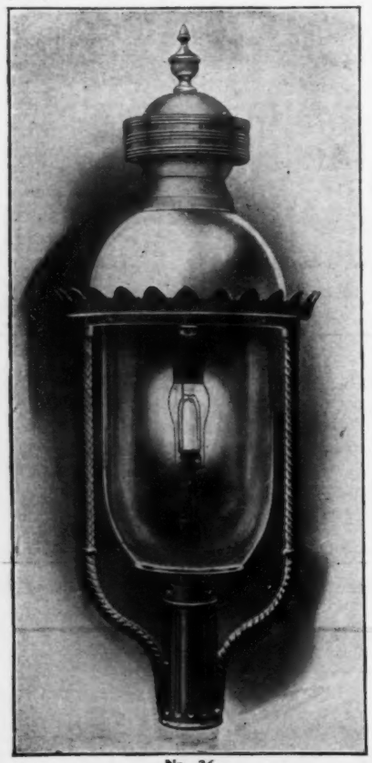

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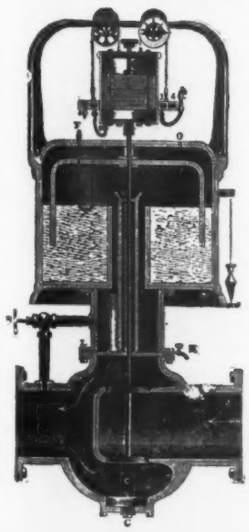

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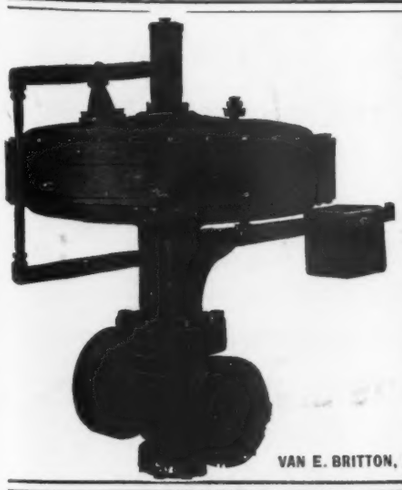

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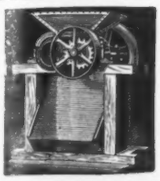

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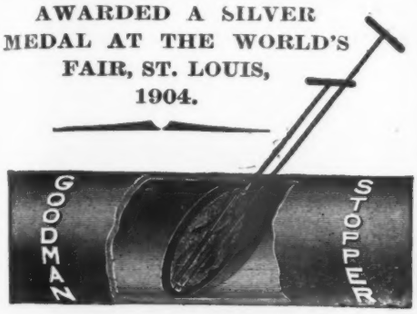

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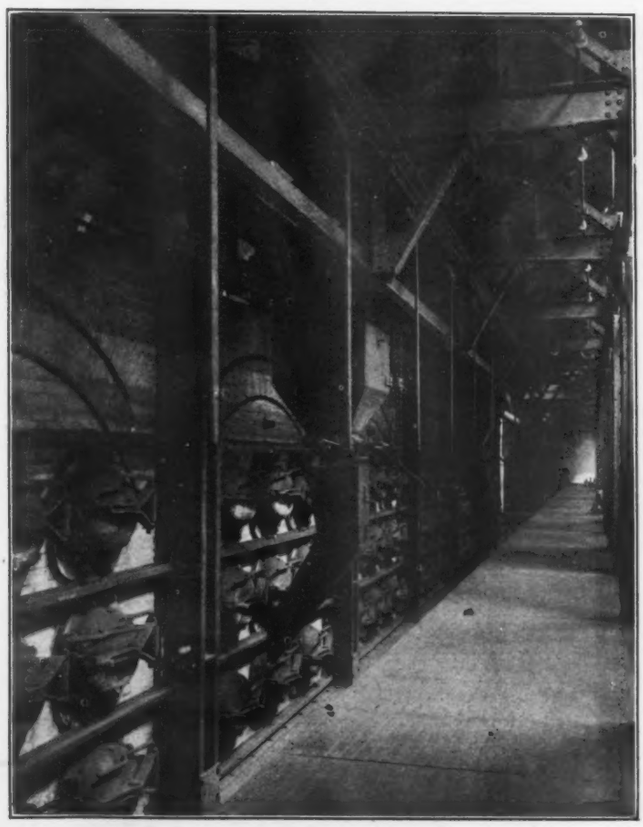

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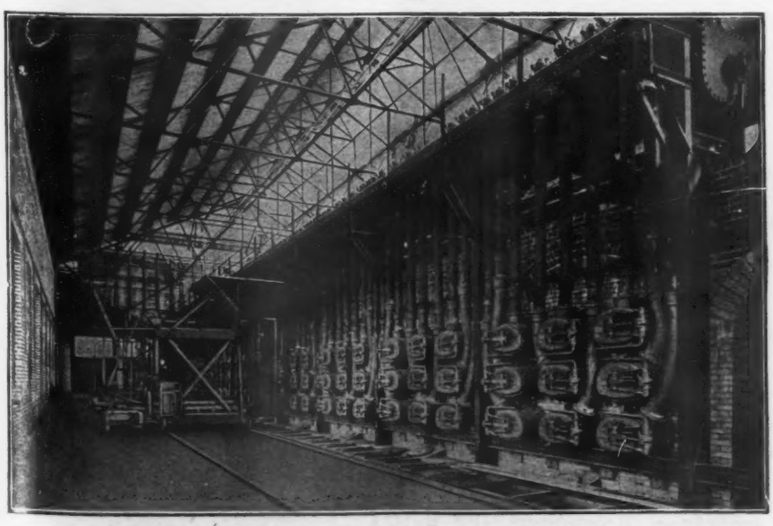

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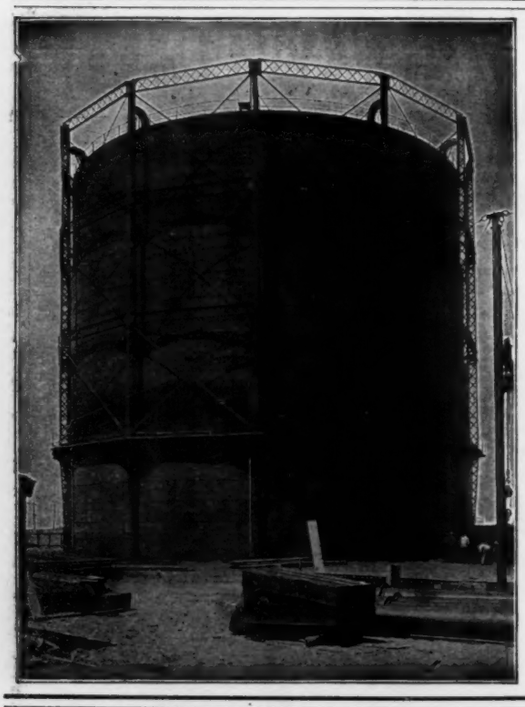

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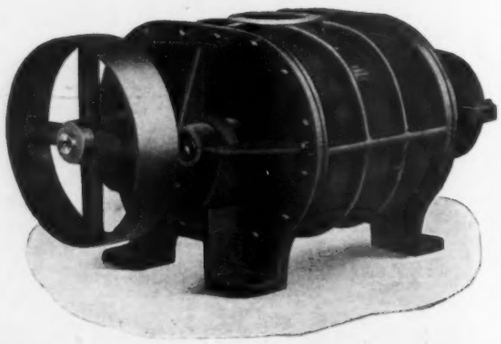

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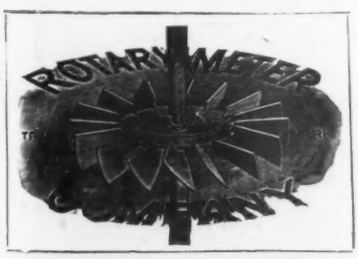

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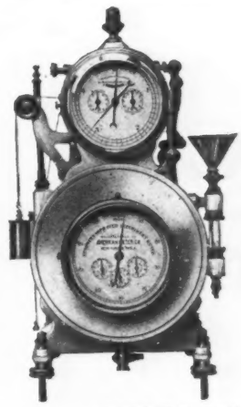

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